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LATA Parallax

LATA/PARALLAX PORTSMOUTH, LLC

# NUCLEAR MATERIALS CONTROL AND ACCOUNTABILITY PLAN PORTSMOUTH GASEOUS DIFFUSION PLANT PIKETON, OHIO

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POEF-1197/R8

# Nuclear Materials Control and Accountability Plan
# Portsmouth Gaseous Diffusion Plant,
# Piketon, Ohio

**Date Issued: December 23, 2008**

LATA/PARALLAX PORTSMOUTH, LLC
Managing the
Environmental Management Activities at the
Portsmouth Gaseous Diffusion Plant
Under contract DE-AC24-05OH20192
for the
U.S. DEPARTMENT OF ENERGY

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# 1.0 INTRODUCTION

## 1.1 Purpose of Plan

This Nuclear Materials Control and Accountability (NMC&A) Plan describes the features of the program in place to control and account for nuclear materials for DOE interests managed by LATA/Parallax Portsmouth, LLC (LPP) at the Portsmouth Gaseous Diffusion Plant (PORTS), This plan excludes the $UF_6$ cylinder storage lots, which are managed by Uranium Disposition Services under a separate NMC&A plan. This plan is issued for routine use by those involved with the functioning of this program and others for informational purposes. Issuance of this plan complies with requirements of DOE M 470.4-6 "Nuclear Material Control and Accountability."

This plan provides a broad overview of the plant's NMC&A program. It is to be used in combination with various other plant procedural directives defining NMC&A requirements for specific facilities and specific NMC&A program components. This plan applies to nuclear materials possessed by DOE in areas not leased to the United States Enrichment Corporation (USEC), excluding the $UF_6$ cylinder storage lots. USEC operations within leased and certified areas of the plantsite are under regulation of the Nuclear Regulatory Commission (NRC).

## 1.2 LPP Policy for Control and Accountability of Nuclear Materials

It is the policy of LPP and USEC, as service provider, to maintain an effective and cost-efficient program for the control and accountability of all nuclear materials in the possession of DOE at PORTS. This is accomplished using the graded safeguards concept, which takes into account the material's strategic importance as well as its intrinsic value and its importance to the plant's operating mission. USEC is responsible for developing and implementing the NMC&A program, providing government-furnished service to LPP. LPP is responsible for managing the nuclear material in their possession in a manner consistent with this NMC&A plan.

## 1.3 Applicable DOE Orders and Regulatory Documents

This plan uses as its basis the following DOE Order and Manuals:

DOE O 470.4, "Safeguards and Security Program," dated August 26, 2005.

DOE M 470.4-6, Change 1, "Nuclear Material Control and Accountability," dated August 14, 2006.

In addition, the PORTS NMC&A program is integrated with the physical security and information security requirements contained in the following:

DOE M 470.4-1, Change 1, "Safeguards and Security Program Planning and Management," dated March 7, 2006.

DOE M 470.4-2, Change 1, "Physical Protection", dated March 7, 2006.

Beyond these direct requirements, the plant's NMC&A system is structured to be consistent with DOE orders and directives related to environment, safety, and health. Plant operational requirements and the important role that the nuclear materials accounting system plays in programmatic and financial reporting are also key considerations in NMC&A program features.

## 1.4 Procedural Directives

Various procedural directives have been written and issued for implementing the elements of this NMC&A Plan document. Procedures maintained by USEC are controlled and distributed electronically via the plant's Intranet system. These include NMC&A Group level procedures as well as NMC&A-related procedures (e.g., measurements, physical inventory) maintained by Operations, Production Support, Maintenance, and other organizations. Programmatic NMC&A procedures maintained by the NMC&A Group are listed in Appendix A. Procedures at the "XP2" level include actions and responsibilities for multiple organizations and functions. "XP4" level procedures listed are specific to actions performed by the NMC&A Group. In addition procedures specific to actions performed by LPP are in place.

Security plans, procedures specific to facilities possessing special nuclear material, and NMC&A-approved LPP procedures also exist as necessary. NMC&A procedural directives will be reviewed every three years. Procedures will be revised and reissued as needed. Procedures are available to DOE for review and will be provided to the operations office upon request.

## 1.5 Plan Reviews, Revisions, and Change Control

This plan is considered a "living document." As such, changes will be made periodically by re-issuing specific sections of the plan. Required revisions that contain substantial changes to the NMC&A program, such as reductions in safeguards, will be approved by the DOE Oak Ridge Office (ORO) Materials Control and Accountability/Information Security (MC&A/IS) Branch Chief prior to issuance. Minor changes, such as organizational name changes, updating of account numbers, material codes, material balance areas, and other administrative changes can be made with the approval of the PORTS NMC&A Group Manager. This plan will be reviewed in total, at least once every three years and revised as required.

## 1.6 Threat Considerations

The NMC&A program at PORTS, as described in this document, was originally developed based on careful consideration of the full spectrum of outsider and insider threats described in Department of Energy (DOE) threat guidance issued in 1996. The plant's NMC&A program gave special consideration to the potential of an insider threat. The threat guidance was updated in 1999, 2003 and 2005.

In 1999, programs to reduce the quantities of Highly Enriched Uranium (HEU) material at the site were completed. PORTS is no longer a Category I facility, nor is there a credible scenario for accumulating a Category I quantity of material via rollup. Vulnerability assessments and performance tests are conducted in accordance with DOE requirements.

## 1.7 Brief Description of the Plant, Its Operations, and Principal Nuclear Materials Flows

Additional information on these subjects is contained in various later sections of this plan. This section provides a general overview for those not familiar with the plant.

The Portsmouth Gaseous Diffusion Plant is located on a 4,000 acre tract of government property in rural Pike County, Ohio. The site is on the east side of the Scioto River, approximately equidistant between the two largest cities in the area, Portsmouth and Chillicothe. Appendix B is a map of the PORTS site.

UDS manages all of the DOE $UF_6$ cylinder lots. LPP manages the remainder of the nuclear materials in DOE areas at PORTS. Some functions, including implementation of the NMC&A program for DOE interests, continue to be performed by USEC as a government-furnished service to LPP, under a work authorization between USEC and DOE.

The plant's primary mission was the safe and efficient enrichment of uranium in the form of uranium hexafluoride, using the gaseous diffusion process. When initially constructed and until the late 1960's, the plant produced only highly enriched uranium for defense programs. As commercial nuclear power reactor programs expanded in the 1970's and defense requirements dropped, an increasing portion of the plant's production was shifted to production of low assay product in the range of 2 to 5 weight percent $^{235}U$. Operation of all of the plant's production facilities, including the enrichment cascade, is performed by USEC under regulation of the NRC. In 2001, USEC transferred the uranium enrichment function to the Paducah Gaseous Diffusion Plant. The Portsmouth cascade was placed in a cold standby mode, capable of resuming operations within 18-24 months, if needed.

With very minor exceptions (several small radioactive standards), all special nuclear material at PORTS is enriched uranium. Efforts to remove Highly Enriched Uranium (HEU) stored as oxides at the site were completed in 1999 by transferring the material to other DOE and NRC facilities. At the same time, a program was initiated to designate PORTS as a strategic Uranium Management Center for DOE. PORTS began accepting uranium materials from DOE facilities throughout the country for storage. Essentially all other nuclear material shipments and receipts to and from the plant involve $UF_6$ contained in metal cylinders.

Depleted $UF_6$ (or tails), previously withdrawn from the bottom of the cascade into 14-ton cylinders under DOE operations, were placed into long-term storage. Low enriched, normal, and depleted $UF_6$ in 2.5, 10, and 14-ton cylinders is stored in several outdoor storage yards. A small amount of Highly Enriched Uranium from operations in prior years is stored in the X-345 vault facility. Highly Enriched Uranium in the form of $UF_6$ was re-fed to the USEC-operated cascade in a campaign which ended in July 1998. HEU materials remaining as heels in 5", 8" and 12" cylinders were removed via solution cleaning on site at X-705, or sent off site for disposition. The cleaning program was completed in March 2000. Assorted small cylinders that were returned from ETTP are stored in X-345.

Various non-$UF_6$ materials are also present at the plant as a result of process equipment failures, process vent gas trapping systems, routine equipment decontamination and cleaning activities, and laboratory operations. The primary chemical forms are uranyl fluoride contained in various media, uranium-bearing solutions, uranium oxides resulting from recovery operations in the X-705 Decontamination and Recovery Building, and contaminated oils and solids.

Once uranium is changed from the chemical form of $UF_6$, the material is considered scrap since it is no longer of any value in meeting the plant's mission of uranium enrichment. Until 1978, a system existed for conversion of uranium oxide to $UF_6$. This facility within X-705 is no longer in operation. While these non-$UF_6$ materials are considered scrap in terms of plant programmatic objectives, many of them have high strategic and financial value. Controlling and accounting for these materials is an important aspect of the plant's MC&A program. If economically recoverable, these materials are converted into high purity, low enriched $U_3O_8$ and are stored until they can be shipped to another facility that can utilize the material. Non-$UF_6$ uranium materials produced before July 1, 1993, and most materials >10% assay are retained on the accounting records as DOE-owned materials.

Located adjacent to the gaseous diffusion plant to the southwest is the Gas Centrifuge Enrichment Plant (GCEP). The GCEP facilities were constructed during the early 1980's, but in 1985 a decision was made to terminate the DOE gas centrifuge program. The facilities have been in shut-down status since that decision was made. In 2006 all nuclear materials and old centrifuge equipment were removed from the plant. The nuclear material and equipment has been transferred to an approved disposal facility. The GCEP facility was turned over to the American Centrifuge group, which is now licensed by the NRC. Prior plans for IAEA surveillance of GCEP operations were abandoned along with the program.

## 2.0 DEFINITIONS AND ACRONYMS

This section contains several key terms included in DOE orders and provides the definitions of various site-specific terms and abbreviations used in this document. Other definitions of terms are contained in specific sections of the plan.

**Accountability** - The knowledge of how much nuclear material is supposed to be present in a given location and how much material is actually present.

**Account number** - A three digit number which identifies the material account to which containerized or in-process nuclear materials are assigned. Accounts can be **processing accounts** or **storage accounts**.

**Assay** - As used in the uranium enrichment industry, the $^{235}U$ isotopic concentration relative to total uranium in a uranium-bearing material, typically stated in weight percent (e.g., 4.95% assay).

**Attractiveness level** - A categorization of nuclear material types and compositions which reflect the difficulty of processing and handling required to convert the material into a nuclear explosive device. Typical materials at PORTS have an attractiveness level of C, D or E, with level C being the most attractive. For the materials present at PORTS, Appendix C-1 presents a decision tree that can be used to determine the appropriate attractiveness level. It should be noted that the attractiveness level of materials is determined by physical, chemical, and isotopic characteristics and not the quantity of $^{235}U$ involved.

**Book Inventory** - The amount of nuclear material shown on book records to be present in a **MBA** at a given time.

**Category Quantities of SNM** - A system of categorizing quantities of various nuclear materials and the **MBA's** which contain them based on the relative ability to use the quantity of material to make a nuclear explosive device. The defined material quantity categories are I, II, III, and IV, with category I being the most readily used for this purpose. The material category depends on the quantity of $^{235}U$ involved as well as the attractiveness level of the material in which the $^{235}U$ is contained, according to the matrix of these two factors shown in Appendix C-2.

**Cold trap** - A system used to de-sublime gaseous $UF_6$ into solid form. A typical cold trap system consists of a refrigerated environment into which a two-valved small cylinder is placed. The $UF_6$-containing gas is passed through the cylinder, and the $UF_6$ component de-sublimed inside the cylinder. Other light gases (typically air) pass out the other cylinder valve.

**Composite sample** - A single sample prepared from samples from several containers by combining them in ratios that are proportional to the net weights or volumes of the individual containers sampled. The attributes determined by analysis of the composite sample reflect the average attributes of the collective contents of the individual containers sampled.

**Control** - The ability to limit the access to, movement of, and location of nuclear materials to those personnel and situations which are consistent with safeguards requirements and procedures.

**Confirmatory measurement** - A measurement made to test if some attribute or characteristic of the nuclear material is consistent with the expected response for that material if no change has occurred. A confirmatory measurement can include qualitative, semi-quantitative, or **verification** measurements.

**D&D** – Decontamination and Decommissioning

**Diversion** - The unauthorized movement of nuclear material from its approved use or authorized location. As differentiated from **theft**, a diversion typically involves a movement within a secured area, while a theft involves a removal from that secured area.

**DMSA** - DOE Material Storage Area

**DYMCAS** - Dynamic Nuclear Materials Control and Accountability System, the near-real time computer system which is used to control and account for nuclear materials at PORTS and provide routine transaction and inventory reports to NMMSS.

**DYMCAS location** - A four or five character alphanumeric symbol (such as 326L or 7725W) which identifies on the **DYMCAS** data base the facility or area within a facility in which a nuclear material container is located.

**GBA** – The reporting identification symbol used in conjunction with **NMMSS** to identify nuclear materials in the possession of LPP at PORTS.

**GCEP** - Gas Centrifuge Enrichment Plant.

**GDP** - Gaseous Diffusion Plant

**HASA or High Assay Sampling Area** – Former processing MBA which is located within the center section of X-345 and which is now shut down but was used to sample small cylinders containing highly enriched $UF_6$.

**Heel** - The residual amount of $UF_6$ remaining in a cylinder after that cylinder has been emptied by gas-feeding to the cascade or by liquid transfer to another cylinder.

**High assay uranium** - Any uranium-bearing material with an assay of 20 wt. percent or more, regardless of material type or quantity.

**HEU or Highly Enriched Uranium** - In various documents, can be used in either of two ways: (1) synonymous with high assay uranium, or (2) specifically referring to $UF_6$ product at an assay of 93.15% (sometimes simply referred to as **HE**), which was the original standard product of the plant. In this document, the term will be used according to the first definition.

**ID or Inventory difference** - The difference between the book inventory and the physical inventory taken for a **MBA**, account, or facility. This term is also referred to as the Book-Physical Inventory Difference, or **BPID**.

**Item** - A controlled container used for nuclear material, which has a unique identification and previously determined material mass, whose integrity can be visually verified.

**Large cylinders** - This term includes 2.5, 10, and 14-ton $UF_6$ cylinders. These are constructed of steel.

**LPP** – LATA/Parallax, LLC

**LEU or Low Enriched Uranium** - Any uranium-bearing material with an assay greater than 0.711 wt. percent, but less than 20 wt. percent, regardless of material type or quantity.

**MBA or Material Balance Area** - A defined geographical area involving an integral operation and within which nuclear materials are controlled and accounted for, with a single individual designated by management as responsible for all such nuclear materials.

**MBA Management Team** - A specified group of individuals who have responsibility for the control and accountability of nuclear materials in the MBA. The MBA Representative is the key individual on each MBA Management Team.

**Material type code** - A three digit number used within the **DYMCAS** database to identify nuclear materials according to chemical form, presence of certain contaminants, and/or source of the material.

**MC&A** - Materials Control and Accountability

**Missing item** - An item that contains nuclear material and remains unaccounted for after the reconciliation has been completed.

**NDA** - Non-Destructive Assay, which is the measurement of one or more attributes of nuclear materials by analyzing radiation signals from the material. When used for accountability purposes these measurements must be performed by an approved group.

**Normal feed** - $UF_6$ at the naturally occurring assay of 0.711% $^{235}U$.

**NMMSS or** Nuclear Materials Management and Safeguards System - The DOE/NRC system located at Norcross, Georgia, which is used to manage and account for nuclear materials in the United States.

**ORO** - Oak Ridge Office

**PORTS** - Portsmouth Gaseous Diffusion Plant.

**PG dust** - An in-house term used at PORTS to refer to the solid residues (or "dust") contained in and removed from equipment which processes $UF_6$ (or "PG," short for process gas). This residue consists of various uranium/fluorine compounds resulting from reaction of $UF_6$ with moisture or metals. The principal compound is typically uranyl fluoride ($UO_2F_2$). PG dust can be of widely varying uranium purity, containing varying amounts of rust, metal shavings or powder, and other non-uranium materials.

**Physical inventory** - The quantity of nuclear material which is determined to be on hand by physically ascertaining its presence using techniques that include sampling, weighing and analysis as well as verifying the presence of nuclear material containers with known contents.

**Processing account** - An account associated with a specific **processing MBA** (or specific processing step within such a MBA), which identifies both the current programmatic status of the nuclear materials assigned to the account (including **RIS**) and the material location. Both in-process materials and containerized materials can be assigned to such accounts.

**Processing MBA** - A **material balance area** in which there is routine processing of nuclear materials, with materials being transferred from one container to another as well as possibly some assay change and/or chemical form change in so doing. A processing MBA will have an in-process inventory or, at minimum, process holdup material at inventory times. Performance of a physical inventory will typically result in a non-zero inventory difference due to measurement uncertainties.

**Purity** - Generically, the relative abundance of a desired material as compared to the total mass (or volume) of material in which it is contained. Unless otherwise specified, the term is used in this document to refer to the amount of total uranium per unit mass (using the units grams U per gram) or per unit volume (using the units grams U per liter).

**Reconcilable entry** - An error resulting from the mismatch between the book inventory and the physical inventory. These errors must be investigated until either resolved or declared missing.

**RIS or Reporting Identification Symbol** - These are unique three (or four) letter symbols used in conjunction with **NMMSS** to identify nuclear materials at this and other plants. At PORTS, three different RIS's are used to identify programmatic and financial ownership of nuclear materials in various DOE facilities. The RIS for LPP managed material is GBA.

**Safeguards** - An integrated system of physical protection, accountability, and material control measures designed to deter, prevent, detect, and respond to unauthorized possession and/or use of **SNM**.

**Seals** - This term can be used in either of two completely different ways: (1) synonymous with tamper-indicating device, or (2) the equipment systems attached to each end of the rotating shaft of cascade compressors, which routinely fail and must be disassembled and decontaminated prior to rebuilding. When used in the latter sense, the term **compressor seals** will be used.

**Small cylinders** - This term includes 5, 8, 10, 12, and 13-inch diameter $UF_6$ cylinders. By far the most common types of small cylinder in active use at PORTS are 5-inch cylinders. These are constructed of steel, monel, nickel or aluminum.

**SNM or Special Nuclear Material** - The vast majority of SNM used at the PORTS is enriched uranium. While DOE orders state that all enriched uranium (any assay above 0.711%) is SNM, some confusion may occur because historically the term has been used at PORTS to refer only to highly enriched materials and in some cases only to high purity, highly enriched materials. As used in this document, **SNM** refers to all materials that contain uranium at assays above 0.711%. If reference is made only to enriched uranium at or above 20%, the term **highly enriched uranium** will be used, not **SNM.**

**Source material** - Materials from which **SNM** can be produced. For PORTS, this includes normal and depleted uranium.

**Storage account** - An account to which only containerized materials (no in-process materials) are assigned on the **DYMCAS** data base and which identifies the intended use or other programmatic status of the materials (including **RIS**). Since materials in such an account can be located in more than one MBA, the container **DYMCAS location** is needed to determine the MBA in which the container is located and the **MBA Management Team** responsible for the contained material. Containers assigned to storage accounts can be located in certain designated areas within **processing MBA's**.

**Storage MBA** - A **material balance area** in which all nuclear materials are containerized with measured values and are being stored for future processing, disposal, or shipment. Some minor sampling of containers can occur within a storage MBA. Within storage MBA's, nuclear materials are controlled and accounted for primarily on an item basis and non-zero inventory differences do not typically occur unless there is an anomaly of some type.

**Tails** - Depleted $UF_6$ at an assay below 0.711%, which is withdrawn from the "bottom" of the cascade and placed into long-term storage in 14-ton cylinders. The term is also used to informally refer to the Tails Withdrawal Station located at the northeast corner of the X-330 Process Building.

**Theft** - The intentional, unauthorized removal of nuclear material to a location not authorized to contain nuclear material.

**TID or Tamper-Indicating Device** - A device that has unique design characteristics that will provide evidence that the integrity of the container or other item (door, valve, etc.) to which it is applied has or has not been violated.

**TR or Transaction Report** - A **DYMCAS** generated document authorizing the movement of nuclear material containers between facilities or between MBA's within a facility.

**Trap materials** - Solid materials used throughout the plant in chemical traps for the removal of residual quantities of $UF_6$ in gases vented to the atmosphere. Typical materials used are pelletized activated alumina and sodium fluoride. After use, the materials will contain varying amounts of uranium, typically in the chemical form of uranyl fluoride.

**Unaccounted-for item** - Any discrete item that cannot be physically located (or otherwise accounted-for).

**USEC** - United States Enrichment Corporation.

**Verification measurement** - A quantitative re-measurement to verify an existing measured value as previously recorded.

**VHE or Very Highly Enriched** - Specifically refers to $UF_6$ product at assays between 96.9% and 97.65%, which was previously produced for and supplied to the Naval Reactor Program.

**VXA** - The reporting identification symbol used in conjunction with **NMMSS** to identify disposal of DOE nuclear materials to burial grounds or holding ponds at PORTS.

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## 3.0 ORGANIZATION AND RESPONSIBILITIES

This section describes the organizational structure used to administer and implement NMC&A program activities for DOE operations at PORTS. It describes the roles and responsibilities of those Organizations and Groups which have key roles in the functioning of the NMC&A system. It also explains the MBA Management Team approach used at PORTS and defines the roles and responsibilities of team members.

LPP is the primary DOE contractor to manage environmental remediation activities at PORTS. NMC&A program requirements are implemented primarily by USEC personnel who provide government-furnished services to LPP as described in a work authorization between USEC and DOE. In addition LPP may utilize measurement services from USEC or an approved contractor. Appendix D presents an organizational chart of the LPP management structure as it relates to USEC NMC&A Group and DOE operations.

The USEC NMC&A group has the lead responsibility for planning, coordinating, and managing the plant's NMC&A system. The NMC&A Manager has been designated by plant management (and approved by the DOE-ORO MC&A/IS Branch Chief) as the management official who is directly responsible for the control of and accounting for nuclear materials at PORTS. The Manager, NMC&A reports to the Manager, Nuclear Safety and Quality. Thus, the NMC&A Manager and the NMC&A group are organizationally independent from persons responsible for program operations, as required by DOE M 470.4-6. A more detailed discussion of the Manager's responsibilities and those of the NMC&A group is presented later in this section.

### 3.1 MBA Management Teams

DOE nuclear materials management activities at PORTS are divided into several geographical material balance areas (MBAs). These are discussed in further detail in a later section of this plan. In order to manage these MBAs in a proper manner, a system of defined responsibilities has been established, creating a MBA management team for each MBA. All team members are LPP personnel except for NMC&A Support positions, which are filled by USEC NMC&A personnel. The following positions are defined for each MBA team:

1. **Administrator** - For each MBA, this person is defined by the management organization of the plant and the MBA boundaries. The administrator is typically defined as the lowest level of management who has administrative authority over all parts of the MBA. The same individual may be the Administrator for more than one MBA. In terms of the plant's management chain-of-command, this person has ultimate responsibility for the activities within the MBA as they relate to the control of and accounting for nuclear materials. The MBA Administrator's management position bestows the authority needed to enforce necessary NMC&A actions by those working within the MBA. The MBA Representative and alternate may report administratively to this person, but this is not a requirement.

2. **Representative** - For each MBA, this person is the single individual (usually with a designated alternate) who is given overall responsibility for all nuclear materials within the MBA and is responsible for assuring that all material control and accountability policies and procedures are consistently implemented in that MBA. Thus, the MBA Representative is the primary material custodian of the MBA and is the most important person on the MBA management team. The MBA Representative, by being named to this position by the Administrator and by being approved by the NMC&A Manager, is given the authority required to carry out these responsibilities. The following points further define the MBA Representative position:

   a. The MBA Representative is the primary point-of-contact with the NMC&A group on material control and accountability matters pertaining to the MBA and is to be knowledgeable of NMC&A policies, procedures, and concerns related to the MBA.

   b. The MBA Representative is the person with whom the NMC&A and Security groups will deal in the event of a nuclear materials alarm or emergency situation in the MBA.

   c. The MBA Representative has the authority to refuse the shipment of, receipt of, or possession of nuclear materials when such would violate established policies and procedures.

   d. The MBA Representative has the responsibility to know the quantity, type, and location of nuclear materials in the MBA. [Note: This implies a general up-to-date knowledge of such information and the ability to promptly obtain more detailed information when necessary.]

   e. The MBA Representative oversees the activities of other nuclear materials custodians, handlers, and operators in the MBA.

   f. The MBA Representative has the authority to input data into DYMCAS and other documentation systems; the MBA Representative **does not** have the authority to handle, process, or move nuclear materials or empty nuclear materials containers.

   g. The MBA Representative may not ship material to himself/herself. Thus, if one individual has NM Representative responsibilities in more than one MBA, an alternate Representative must be involved in any transfers of nuclear material between the MBAs.

h. The MBA Representative has the authority to call for a special inventory of all or a selected portion of his/her MBA for any reason (in addition to the routinely scheduled MBA inventories and any special inventories called by the NMC&A group).

i. If specific material quantity/type/assay limitations are placed on the MBA, the MBA Representative is responsible for assuring that these limitations are not violated. The Representative must be given access to the information to meet this responsibility.

j. Due to the importance of the MBA Representative position, a specifically designated alternate is usually designated for each MBA. The alternate is given the authority to serve in the absence of the MBA Representative.

3. **Nuclear Material Custodians** - Within each MBA, a nuclear material custodian is an individual who has primary responsibility for all nuclear materials within a defined portion of the MBA and/or during a specific shift of operation. The custodian might or might not actually handle nuclear materials. Within the MBA management team, all custodians function under the oversight of the MBA Representative.

4. **D&D Workers** - Within each MBA, various persons will directly perform functions associated with the processing, handling, sampling, measuring, inventorying, and movement of nuclear materials. These personnel are responsible for following all established procedures for accomplishment of these objectives so that the intent of the NMC&A system for the MBA is consistently achieved to a high degree.

5. **NMC&A Support Person** - For each MBA, a single person (and alternate) within the NMC&A group will be designated to maintain routine contact with the MBA Representative and custodians on matters related to the proper functioning of the NMC&A system for that MBA. This support person should be a resource for knowledge of MBA procedures, operating conditions, and problem areas and should assist in maintaining the appropriate level of documentation of MBA procedures and practices. This individual may also be directly involved in the reconciliation of MBA inventories by the NMC&A group.

### 3.2. USEC Nuclear Materials Control and Accountability

NMC&A services are provided to LPP by USEC through a government furnished services contract or through other contractual means. As stated earlier in this section, the Nuclear Materials Control and Accountability group has the lead responsibility for planning, coordinating, and managing the plant's NMC&A system. The Manager, NMC&A, is the head of the group and is designated by plant management as the management official who is responsible for the control of and accounting for nuclear materials at PORTS. The following points further define the NMC&A Manager's responsibilities, authorities, and limitations of authority.

#### 3.2.1 NMC&A Manager

The NMC&A Manager is responsible for:

1. Assuring that the plant's nuclear materials control and accountability program meets the requirements of all applicable DOE orders and assuring that all source and special nuclear materials are controlled and accounted for in a graded manner consistent with the generic threat and their strategic and monetary value.

2. Coordinating the NMC&A planning function (see section 3.2.3).

3. Assuring that the plant's nuclear materials control and accounting program is defined and documented in the plant's NMC&A Plan and associated procedural directives and that required documents are approved by the DOE-ORO MC&A/IS Branch Chief and by the Portsmouth/Paducah Project Office (PPPO) Security Lead.

4. Assuring that the NMC&A responsibilities of various plant personnel are clearly delineated and that these persons are cognizant of these responsibilities and adequately trained in their performance.

5. Assuring that any plant NMC&A program deviations from applicable DOE orders are clearly documented and submitted to the DOE-ORO MC&A/IS Branch Chief.

6. Assuring that the plant's NMC&A program is appropriately interfaced with the physical protection and security requirements of DOE orders to provide an effective, integrated safeguards system and that emergency plans are established and exercised to successfully respond to and resolve conditions that indicate possible loss of control of nuclear materials.

7. Assuring that an internal review program is maintained which monitors plantwide compliance with NMC&A program procedural directives, identifies needed corrective actions, and confirms that identified problems are successfully resolved.

8. Identifying the budget resources needed to maintain plant NMC&A program compliance with applicable DOE orders in the most economical manner.

9. Reviewing and approving qualification and testing programs to assure personnel responsible for measurement and measurement control functions are adequately trained and qualified.

The NMC&A Manager (and designated alternates) has the authority to:

1. Manage such operations as requesting, receiving, storing, and shipping source and special nuclear materials for the plant. [Note: The NMC&A Manager does not have authority for hands-on involvement.]

2. Request and receive direct access to the General Manager, when and if necessary, to identify emergency conditions which indicate possible loss of control of nuclear materials, to identify any potential vulnerabilities associated with the plant's overall safeguards system, or to identify problems in resolving any known NMC&A program problems.

3. Identify directly to the DOE-ORO MC&A/IS Branch Chief, any of the concerns noted in item 2 above.

4. Deny the processing, handling, or movement of nuclear materials within or to/from any plant facility when such actions would be in violation of plant NMC&A procedural directives or when such actions would result in the possible loss of control of nuclear materials.

5. Require performance of emergency response actions (such as special inventories, facility lock-ups, etc.) when conditions indicate that such actions are needed to maintain and/or verify proper control of nuclear materials.

6. Grant temporary exemptions from accomplishment of plant NMC&A requirements when and if such are necessary to prevent risk to plant personnel or property. Such exemptions shall be granted only with concurrent special precautions taken to assure that loss of control of nuclear materials does not occur.

The NMC&A Manager is forbidden from:

1. Touching, moving, or handling nuclear materials.

2. Entering data into, altering data within, or removing data from the plant's nuclear materials accounting records.

3. Altering physical inventory data.

4. Giving direct orders to plant protective force personnel.

### 3.2.2 NMC&A Group Responsibilities

The NMC&A group includes technical and accounting personnel who have the following responsibilities:

1. Coordination of physical inventories, reconciliation of item inventories against book records, and calculation of inventory differences from submitted inventory data.

2. Management of the DYMCAS system, including responsibility for overseeing the operation of the DYMCAS system, issuing menus, and providing a problem-solving interface between DYMCAS users, programmer/analysts, and maintenance personnel.

3. Measurements program, measurement control, and (in conjunction with Statistical Services personnel) statistical/trend analyses, including ID assessments, ID investigations, and the development and management of variance propagation methods for establishing ID control limits for any processing MBAs.

4. Management of plant nuclear material scrap and waste, including authorizations via DYMCAS for receipt, movement and processing of scrap and waste materials (i.e., non-$UF_6$ nuclear materials).

5. Management of the plant tamper-indicating device (TID) program.

6. Coordination of the development of NMC&A procedures with the plant's Procedures group.

7. Coordination of the plant's NMC&A training programs for specific NMC&A-related functions. The NMC&A Training Coordinator is responsible for developing and coordinating the training of plant personnel in performance of NMC&A duties. In some functional areas, the Training Coordinator will prepare training materials, conduct training sessions, and document trainee attendance and performance. In other functional areas, the Coordinator will advise, support, and review the performance of these activities by other trainers, both within and outside the NMC&A group.

8. Investigation and documentation of all uranium releases to the environment.

9. Monitoring the performance of various NMC&A systems and procedures to assure field compliance. This monitoring supplements, on a daily basis, the internal audits described in section 9.0 of this document.

10. Serving as Nuclear Materials Control Support Persons assigned to provide liaison with MBA personnel.

11. Administering the Tamper Indicating Device (TID) program, including oversight of the procurement, control, and use of TIDs for safeguards and security purposes.

12. Performance and management of plant nuclear materials accounting functions, including accountability records and routine certified reporting.

13. Issuance of DOE/NRC Forms 741 and other required documents related to nuclear materials shipments, receipts, and other transactions.

14. Input of accountability data into the DYMCAS system, and routine data reporting to NMMSS.

15. Maintenance of detailed records for Uranium Management Center transactions and inventories.

16. Calculation and certification of inventory differences.

17. Assistance in physical item inventory reconciliations.

18. Routine auditing of accountability records and data.

19. Interfacing with DOE Finance personnel regarding nuclear material financial records.

20. Interfacing with LPP Safeguards and Security personnel on NMC&A requirements.

21. Maintenance of appropriate journals, registers, and ledgers to maintain accurate records of all nuclear material inventories and transactions.

### 3.2.3 NMC&A Planning

The NMC&A Manager is responsible for planning any future changes and improvements to the plant's NMC&A system and for planning the work needed to comply with new requirements in DOE Orders. This planning function includes the following areas of activity:

1. Determining the need for new or additional personnel in the group for the adequate performance of NMC&A functions.

2. Determining the need for changes and improvements in the plant's computerized NMC&A systems to provide a more effective NMC&A program or to reduce the cost of this program.

3. Defining and implementing improvements in the measurement systems used to quantify nuclear materials.

4. While working with operations, security, and other involved plant personnel, determining changes in the method and location of operations (storage and processing) involving nuclear materials so that programmatic and safeguards requirements can be met in the most cost effective manner.

5. Determining any required changes in the plant's structure, resulting from operational or organizational changes.

6. Reviewing and assessing the NMC&A requirements for any new operations that are to be installed at PORTS.

7. Assuring that actions are taken to respond to and resolve findings or deficiencies resulting from surveys, audits, etc.

## 3.3 USEC Lab Services

USEC Lab Services provides LPP with various services under contractual agreements. The Lab Services organization has two primary responsibilities in the plant's NMC&A program. These are: (1) the measurement of nuclear materials using destructive and non-destructive techniques, and (2) performance of statistical analyses for nuclear materials.

### 3.3.1 Uranium Analysis/Sampling

Utilizing laboratory facilities within the X-710 Technical Services Building, the Uranium Analysis/Sampling section receives both $UF_6$ and non-$UF_6$ samples from various plants and performs subsampling operations and uranium purity and isotopic analyses of the subsamples. This section is responsible for all aspects of the measurement program for this assigned work, under the oversight of the NMC&A group. These responsibilities include procurement and management of measurement equipment, development of measurement procedures, development and control of measurement standards, measurement control and statistical activities, and training of personnel in measurements functions.

### 3.3.2 Applied Nuclear Technology

The Applied Nuclear Technology (ANT) section has the responsibility for the plant's non-destructive assay (NDA) program for nuclear materials. Responsibilities include (1) performance of accountability measurements for containerized non-$UF_6$ materials, (2) performance of routine confirmatory measurements for nuclear materials containers in various locations, (3) performance of process holdup measurements within several MBAs, and (4) development of NDA estimates of process holdup in shutdown equipment in the X-326 Building.

This section has all of the functional responsibilities (equipment, procedures, standards, measurement control, training, etc.) for these measurement activities, as described for the Uranium Analysis/Sampling section, with these responsibilities performed under the oversight of the NMC&A group.

### 3.3.3 Statistician

This section provides statistical support to NMC&A to analyze ID and shipper/receiver difference trends, to establish measurement variances and to develop and implement propagation of variance techniques for calculating ID control limits. The Statistician also oversees the use of quality control standards in the laboratory.

### 3.4 USEC Maintenance

The Maintenance organization provides maintenance, repair, and calibration services for various equipment, items and systems that are essential to the NMC&A program. The most important of these are as follows:

1. Non-laboratory scales and balances are maintained and calibrated by personnel within the Scale Shop. This section is also responsible for the maintenance and calibration of the weight standards used in the mass measurement program. These functions are performed under the coordination and oversight of the Measurement Control Coordinator within NMC&A.

2. Both minor and major repairs to $UF_6$ cylinders are accomplished by Maintenance personnel.

### 3.5 Other USEC Plant Services

USEC provides LPP with a variety of NMC&A-related services through a Work Authorization or other contractual agreement.

#### 3.5.1 Security

The Manager, Security, is responsible for establishing physical security requirements to protect nuclear materials at PORTS, and in this capacity carries responsibilities comparable to those of the Manager, NMC&A. Close daily coordination between these two groups is required to maintain a properly integrated safeguards and security program.

#### 3.5.2 Protective Forces

The Protective Forces section includes the required staff of Security Officers and Security Police Officers to assure that physical security of SNM is maintained and to comply with the related requirements contained in the DOE orders. In terms of cross requirements related specifically to the plant's NMC&A program, this group has the following responsibilities:

1. Operation and management of personnel and vehicle access portals for entry into the Controlled Access Area.

2. Immediate assessment of any physical security alarms which indicate the possible loss of control of nuclear materials, and prompt notification of NMC&A group personnel in any circumstance that requires their assessment and response action.

3. Providing independent material access controls, in addition to those used by custodian personnel, for selected areas and repositories that contain highly enriched uranium.

The section is responsible for developing and maintaining procedures and related documentation for the performance of these responsibilities and for the training of personnel in their performance. Personnel within this section (both uniformed and non-uniformed) are not authorized to handle, process or move nuclear materials.

### 3.5.3 Fire Services & Emergency Management

The Manager, Fire Services & Emergency Management, is responsible for maintaining site readiness to respond to emergency situations. These situations may occur due to man-made events (e.g., spills of hazardous materials) or other activities (e.g., earthquake). Emergency Management is responsible to assure that the plant has adequate response procedures and to maintain the Emergency Operations Center (EOC), which is manned during emergency situations.

The NMC&A Manager may request through appropriate channels that the EOC be activated in the event of an emergency involving nuclear materials.

### 3.5.4 Computing and Telecommunications Security

Staff personnel in the Plant Services organization have responsibility for management of the computer security function at PORTS. This includes computer security activities related to the DYMCAS system. It is the responsibility of these staff personnel to assure that computer security requirements contained in applicable DOE orders are applied to this system and that NMC&A group personnel and other system users have access to the necessary information to maintain such requirements. Inspections and audits of computer security features for this system are also the responsibility of these personnel.

### 3.5.5 Plant Shift Superintendent

PORTS operates on a round-the-clock basis. On each operating shift, a Plant Shift Superintendent is assigned to oversee all plant operations. This position has important responsibilities for managing and coordinating response actions during any abnormal events or situations which occur on a given shift. In this regard, the Plant Shift Superintendent has the authority to act on behalf of the NMC&A Manager during any situation which requires immediate actions, especially when there is the potential for imminent danger to plant personnel or property or for loss of control of SNM. He is responsible for promptly contacting the NMC&A Manager or designated alternates during emergency situations and for contacting and consulting with key NMC&A personnel when guidance or clarification of requirements is needed during times other than normal day-shift hours.

### 3.5.6 Training

The Training organization provides technical and administrative support to the plant's NMC&A program in the key area of training. The Training organization is responsible for the overall coordination of training efforts within the plant. The NMC&A Training Coordinator interfaces with this organization to assure field personnel are trained and certified in a manner consistent with other plant programs. Training is responsible for keeping track of USEC personnel training records including those which pertain to nuclear materials control and accountability. They also serve as training instructors in areas such as scale operations, sampling operations, etc., utilizing training packages that have been reviewed by the NMC&A Training Coordinator. More detail of the NMC&A training program is described in section 10.0 of this document.

### 3.5.7 Nuclear Safety & Quality

The Nuclear Safety and Quality organization is staffed with professional, trained auditors who review the implementation of NMC&A policies and procedures throughout the plant and provide reports of field compliance to the NMC&A Manager and others. Individuals in this organization are responsible for performing audits, tracking resolutions of audit findings, and providing status reports to management. Details of the NMC&A audit program are provided in Section 9.0 of this plan.

### 3.5.8 Corporate Information Technology

The Corporate Information Technology (CIT) organization includes a GDP Applications section and an Operations section (among others). It has responsibility for the management and operation of the plant's central computer system and for the development and maintenance of software for major applications programs resident on this system. Since such applications programs include the DYMCAS system, this organization performs important functions within the plant's NMC&A system.

The GDP Applications section performs system analysis and software development for the DYMCAS system. This is done in close coordination with the NMC&A group, which identifies system requirements and requests changes.

The Operations section operates the central computer system, including DYMCAS operation. The section also provides data entry services for large data entry jobs required by NMC&A, such as entry of physical inventory data. Such services are provided on an as-requested basis.

CIT is responsible for assuring that DYMCAS system applications software performs its required functions and that required documentation of such software is maintained. Sufficient system redundancy and data backup features must exist to prevent loss of operation or loss of critical data. It assures that software changes are thoroughly tested to assure proper performance prior to implementation, and that a high degree of separation of duties and responsibilities exists during software development, testing, and implementation as well as during routine system operation. This assures that individuals are not capable of inadvertently or intentionally compromising system integrity.

### 3.5.9 Cascade Operations

DOE-related activities performed by Cascade Operations are limited to occasional identification of legacy waste (either HEU or LEU) in USEC-leased space, which is subsequently measured and transferred to DOE space. Operation of the enrichment cascade, including the Cold Standby mode of operations, is performed by USEC in leased space under NRC regulatory oversight.

## 3.6 LATA/Parallax Portsmouth, LLC (LPP)

### 3.6.1 MBA Team

LPP is the contractor for DOE environmental remediation activities at PORTS. The MBA Administrator for the DOE MBAs is in this organization. LPP is responsible to assure that nuclear materials in these areas are handled, inventoried and controlled following procedures approved by the NMC&A group. The individuals assigned as official Nuclear Materials Representative and alternates, with authority to submit inventory and transaction reports to NMMSS, are also LPP employees.

### 3.6.2 LPP D&D Handlers

LPP personnel perform accountability weights of nuclear material containers, field sampling operations, and routine physical inventories in DOE storage MBAs. Physical handling of nuclear materials, container movements, TID applications/removals, and physical inventory performance are also accomplished by D&D Handlers.

D&D Handlers transports nuclear material containers between facilities at the plant. This group performs such transports based on DYMCAS-generated instructions initiated by Order Planners or NMC&A.

3.6.3 **Uranium Analysis/Sampling Approved Contractor Services**

An approved contractor may perform uranium analysis for both $UF_6$ and non-$UF_6$ samples from various DOE materials and perform subsampling operations and uranium purity and isotopic analyses of the subsamples. This group must be responsible for all aspects of the measurement program for this contracted work, under the oversight of the NMC&A group. These responsibilities include procurement and management of measurement equipment, development of measurement procedures, development and control of measurement standards, reporting and documenting results, measurement control and statistical activities, and training of personnel in measurements functions.

3.6.4 **NDA Approved Contractor Services**

An approved contractor may perform non-destructive assay (NDA) measurements. If so that group assumes the responsibility for the NDA program for the nuclear materials for which it provides values. Responsibilities include (1) performance of accountability measurements for non-containerized non-$UF_6$ materials, (2) performance of routine confirmatory measurements for nuclear materials containers in various locations, and (3) performance of process holdup measurements within DOE MBAs.

This group must have of the functional responsibilities for the measurement activities which it is approved. These responsibilities include procurement and management of measurement equipment, development of measurement procedures, development and control of measurement standards, reporting and documenting results, measurement control and statistical activities, and training of personnel in measurements functions. These responsibilities are performed under the oversight of the NMC&A group.

## 4.0 MATERIAL BALANCE AREAS

Those DOE facilities at PORTS which contain nuclear materials and are the responsibility of LPP are divided into six material balance areas (MBAs). As described in DOE M 470.4-6, an MBA is a defined geographical area involving an integral operation and within which nuclear materials are controlled and accounted for, with a single individual designated by management as responsible for all such nuclear materials.

Three different functional types of MBAs have been defined, based on the activities which take place in the MBA. The three functional types are:

1. **Processing** - An MBA in which there is routine transfer of nuclear materials from one container to another as well as possibly some assay change and/or chemical form change in the process. Since measurements are required to define material flows through the process and to perform physical inventories so that periodic material balances can be constructed for the MBA and since these measurements have associated uncertainties, a processing MBA will typically have a non-zero inventory difference for each inventory period.

2. **Storage** - An MBA in which all materials are containerized with measured values and are being stored for future processing or shipment. Some minor sampling of containers can occur in a storage MBA. Since nuclear materials in a storage MBA are primarily accounted for on an item basis, a true storage MBA will typically have a zero inventory difference for each inventory period if all items are accounted for and their integrity and previously documented measured values are confirmed.

3. **Receiving/Shipping** - An MBA from which materials are shipped from plantsite or into which materials are received at the plant. This MBA type will normally not exist alone since a storage and/or processing function will typically also be performed in a given receiving/shipping MBA.

As implied in item 3 above, some MBAs will be a combination of these functional types.

### 4.1 MBA Listings and Summary Information

Appendix E-1 provides a listing of the six DOE MBAs, along with the facilities included in each MBA, the functional type, and the SNM category quantity designation for each MBA. For the location of listed plant facilities, refer to Appendix B. For an understanding of category quantities of SNM, see Appendix C and Section 2.0 for the associated definitions.

As seen in Appendix E-1, two MBAs are operated as category III MBAs; these include the X-345 LEU/HEU Storage MBA and DOE Material Storage Area #12 (DMSA-12). The remaining MBAs contain no more than Category IV quantities of material.

Appendix E-2 provides a schedule for the performance of physical inventories for each of the MBAs. In each case, the MBA inventory frequencies exceed the minimum frequency requirements set forth in DOE M 470.4-6.

Those MBAs which are most active are inventoried on a semiannual schedule. MBAs with little or no activity are inventoried annually. In the Large Cylinder Storage MBA, only those sections which have been active are inventoried in total annually. Cylinders in the long-term, inactive storage portion of the MBA are inventoried annually, on a statistical basis only.

## 4.2 Description of MBAs

All of the MBAs described in this section are managed for DOE by LPP. Each of the DOE MBAs is described below, with the level of detail provided dependent on the complexity of the MBA's functions and operations.

### 4.2.1 Scrap Storage MBA (MBA #7)

This MBA is used to store mainly low assay, non-$UF_6$ scrap and waste and some drums of attractiveness Level E, high assay scrap material. This includes drums containing uranium-bearing materials, five-inch cans and drums containing contaminated trapping materials, five-inch cans containing uranium oxide, and drums and five-inch cans of other miscellaneous non-$UF_6$ scrap and waste.

X-744G is also being used to store various uranium materials received at PORTS as part of the DOE Uranium Management Center. These materials include depleted, normal, and compounds of low enriched uranium, in the form of $UF_4$, oxide pellets, oxide powder, fuel rods, metal ingots, and various other configurations. These materials originated from many different DOE facilities, including Fernald, Hanford, various universities, and other sites. They are stored in different sized containers, including Half High Metal Boxes, drums, Thorium Overpack Containers, and other types. The materials are to be stored at PORTS pending identification of an end use by DOE. Once this determination is made this facility may be used for staging and preparing materials for shipment off-site for processing or disposal.

X-744G is operated as a category IV MBA. It is inventoried semiannually.

### 4.2.2 LEU/HEU Storage MBA (MBA #10)

The LEU/HEU Storage MBA is a storage and shipping/receiving MBA which consists of the center section of the X-345 SNM Storage facility and the North and South Vault areas. These areas were previously managed as three distinct MBAs. However, with the reduction in quantities of HEU remaining, the facility no longer warrants separate MBAs.

The MBA was previously used to sample five-inch cylinders of HE and VHE $UF_6$. The High Assay Sampling Area (HASA) located in the west portion of the MBA was used for this purpose. Five-inch cylinders containing VHE $UF_6$ were removed from vault storage and heated in each of two electrically heated autoclaves in HASA. Using a composite-of-six-cylinders technique, representative liquid samples of each six-cylinder batch were obtained. Following cool-down and weighing, the cylinders were returned to vault storage. Shipment of VHE product to Nuclear Fuel Services, Inc., in Erwin, Tennessee, was concluded in 1993. The shutdown system contains some inaccessible holdup of HEU materials in the piping and equipment.

A non-$UF_6$ transfer glovebox is also located in the MBA and was previously used for the sampling and transfer of high assay oxides and uranyl nitrate hexahydrate (UNH). Also, in the northwest corner of the center section, the high assay Standards Laboratory was used to store and handle high assay $UF_6$ standards materials.

The eastern portion of the center section may be used for loading and unloading small containers being shipped from the plant and being received at the plant. Such shipments are not expected to occur on a routine basis.

The North and South vaults are used to store small containers of non-$UF_6$ (North) and $UF_6$ (South) materials. Containers are stored in within-ground receptacles, above-ground storage racks and carts, and storage cabinets. The storage receptacles may or may not be protected with Tamper Indicating Devices.

Sections within the MBA may be set aside to use for processing small UF6 cylinders for disposal. This could include the creation of temporary DMSA's to be used as write-off areas.

The X-345 LEU/HEU Storage facility is operated as a Category III MBA. It is inventoried semiannually. Holdup contained within the piping of the shutdown HASA system is confirmed annually by performing NDA measurements or by verifying with the facility custodian that no processing has occurred and no equipment has been removed.

### 4.2.3 Oxide Conversion MBA (MBA #14)

The Oxide Conversion MBA consists of three rooms in the northeast section of the X-705 Building. This area was utilized for converting uranium oxide to $UF_6$, but its operation was discontinued in 1978 and the only nuclear materials present are process holdup materials. There are no containerized nuclear materials present in the MBA.

This MBA is classified as a Category IV MBA. There are no transfers of nuclear material to or from other MBAs. Rollup of material between this MBA and the Decontamination/Recovery MBA is not considered to be credible.

An inventory of this area is performed annually. It consists of a verification that no process equipment containing holdup of nuclear materials has been removed since the previous inventory.

### 4.2.4 X-326L Hazardous Waste Storage MBA (MBA #15)

The X-326L Hazardous Waste Storage MBA consists of a cage on the ground floor of the X-326 Building. Within the cage, there are storage locations for items containing mixed hazardous wastes, i.e., radioactive, RCRA wastes. Containers include 55-gallon drums, 5" diameter cans, polybottles, and other small containers. Materials in these containers originate from high or low assay operations throughout the plant. Typical wastes include mixed acids, organic solvents, spent alumina, vacuum sweepings and other items containing both uranium and hazardous waste components.

The X-326L MBA is a Category IV area and is inventoried semiannually.

Efforts are underway to remove the high enriched mixed wastes stored in this area. If the uranium concentration is low enough, materials can be sent to a non-accountable waste storage facility for permanent storage as wastes. Other efforts will involve blending the materials with low enriched or depleted uranium to reduce the $^{235}U$ assay to less than 20%, and shipment of HEU wastes to offsite storage facilities.

### 4.2.5 DOE Material Storage Area #12 MBA (MBA #20)

The DOE Material Storage Area (DMSA) #12 MBA is a storage MBA located on the cell floor of the X-326 process building. It consists of a large area of the cell floor that is enclosed by chain linked fencing with gates that are kept locked except during access to the area. It is used to store a variety of uranium-bearing materials and components. Items stored in the MBA are of a diverse nature. Materials that are collectively below a Nuclear Criticality Safety (NCS) safe mass may be batched into large B-25 boxes that are each tracked and maintained as a single item. Other components and materials are stored in NCS-safe configurations as individual items. These include such things as compressors, compressor seals, valves, pigtails, piping, instrument lines, and many other types of process components.

Inventory records for individual items of materials in the DMSA-12 MBA are maintained locally using computerized spreadsheets. The quantity of material in the MBA is entered on DYMCAS accounting records based on the amount of uranium and $^{235}U$ in specific enrichment ranges. NMC&A is provided documentation whenever materials are transferred into or out of the MBA, so that DYMCAS inventory values can be updated.

DMSA-12 is operated as a Category III MBA. Many of the materials stored in the MBA contain uranium enriched above 20 weight percent $^{235}U$. Rollup of materials contained in the closed B-25 boxes to a Category II level is not credible due to the small quantity of $^{235}U$ in each box (typically <350 grams), the distribution of the material on various scrap and waste materials within each box, the difficulty in recovering uranium from the scrap and waste materials, and the large number of boxes that would need to be breached to collect 6,000 grams $^{235}U$.

This facility may also be used, under an approved security plan, for staging and preparing materials for shipment off-site for processing or disposal.

The MBA is inventoried annually. Items and materials inventoried are reconciled against facility spreadsheet accounting records. The records are reported to NMC&A where the inventory quantities are reconciled against DYMCAS values.

### 4.2.6 DOE Material Storage Area #20 MBA (MBA #21)

The DMSA-20 MBA is located on the upper floor of the X-344 Sampling/Transfer facility. It includes a designated area used for storage of small diameter $UF_6$ cylinders. These cylinders are empty or contain only heel quantities of depleted, normal, or low enriched $UF_6$. The area is not physically isolated from adjacent areas leased by USEC. Material movements and personnel access are administratively controlled.

DMSA-20 is operated as a Category IV MBA. Inventories are performed annually.

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## 5.0 NUCLEAR MATERIALS ACCOUNTING AND TRACKING SYSTEM

An integrated system and related databases are used at PORTS to track nuclear material inventories, to document nuclear materials transactions, to issue periodic certified reports, and to maintain various loss detection elements. The measurements program, which supports the accounting system, is described in a later section.

The plant's nuclear materials accounting and tracking system serves several specific objectives. These objectives include: (1) the accounting for and control of nuclear materials to assure that they are used only for authorized purposes, which includes tracking containerized materials as well as materials undergoing processing, (2) the management and tracking of nuclear materials from a programmatic and financial perspective, and (3) the proper movement and processing of nuclear materials in support of daily plant operations. Various features have been incorporated into the accounting and tracking system to assure that all objectives are met in a compatible and complementary manner.

The Dynamic Nuclear Materials Control and Accountability System (DYMCAS) is the computerized system used at PORTS to accomplish this task. It includes a network of terminals throughout plantsite connected to a central processing system, and the application software used to account for the materials. DYMCAS is described in detail in a later section.

In 1993, the United States Enrichment Corporation was formed. Accounts which contained uranium materials utilized for producing low enriched customer product were transferred to USEC. The existing Reporting Identification Symbols and account structures were redefined to separate materials in USEC's possession versus those in DOE's possession. A description of the accounting structure is provided below.

### 5.1 Accounting System Data Elements

#### 5.1.1 NMMSS Reporting Identification Symbols

The plant uses two different Reporting Identification Symbols (RIS's) to report DOE nuclear materials inventories and transactions to the Nuclear Materials Management and Safeguards System (NMMSS). These RIS's are routinely referred to as "reporting stations" or simply "stations." These are:

GBA – Nuclear materials possessed by LATA/Parallax
VXA - Disposals

GBA is the primary reporting station used for accountable materials in DOE areas managed by LPP at the site. GBA includes some classes of $UF_6$ inventories, including small quantities of DOE-possessed cylinders of low enriched $UF_6$. It also includes non-$UF_6$ scrap and waste materials possessed by DOE, and holdup of uranium in shut down equipment in the X-705, X-345, and X-326 Buildings.

The VXA station does not "possess" any accountable nuclear materials. Instead, it is used as a "pathway" for the disposal of solid and liquid wastes containing accountable materials which are formally removed from accounting records as a result of normal operating losses or transfers to waste storage/disposal facilities.

As seen from the purposes and functions of these reporting stations, they are used primarily for the programmatic and financial management and ownership of nuclear materials, rather than for materials safeguards. Nevertheless, they constitute an essential element of the plant's nuclear materials accounting system.

### 5.1.2 Material Balance Areas

The plant's six geographical DOE material balance areas managed by LPP are discussed in detail in section 4.0 of this plan. There are no true processing MBAs in which nuclear materials have to be tracked and accounted for as they pass through a process or are transferred from one container to another so as to create an inventory difference. Nuclear materials are containerized and are tracked and accounted for on an item basis.

The material balance area to which nuclear materials are assigned is not a specific data element on the DYMCAS data base, but is directly identifiable by use of other data elements identified below (account and/or DYMCAS location symbol). Material balance areas are mentioned here due to their importance in the material accounting and tracking system.

### 5.1.3 DYMCAS Location Symbols

A series of four or five-character location symbols has been developed for assignment to each nuclear material container based on its physical location. These symbols consist of numerical digits which reflect the facility number associated with the location (such as 326 for the X-326 Process Building) followed by alphabetic symbols which designates a localized area within the facility (such as 326L). A listing of the actively used DYMCAS location symbols is given in Appendix F-1.

As seen in Appendix F-1, each DYMCAS location symbol refers to a physical area which is within one MBA. All containers assigned the same DYMCAS location symbol will be located in the same MBA. Likewise, all containers within an MBA will be assigned to one of the DYMCAS location symbols that comprise the areas of that MBA. DYMCAS location symbols are very important in inventorying, accounting for, and tracking containerized materials.

### 5.1.4 Container Location Data

In addition to the DYMCAS Location Symbol, which exists for all containers on the DYMCAS data base, a separate field on the DYMCAS data base exists to identify the specific storage position for a given container within the general area identified by the DYMCAS Location Symbol. This field is set up to permit the entry of section, row, shelf, and position information or storage hole location within X-345. This field is routinely used for those storage areas within the plant which contain a large number of static containers and are set up with a defined storage position system (such as X-744G, the X-326L Hazardous Waste Storage Area, and the two vaults within X-345.)

With the exception of X-345 storage hole locations, which have specific storage grid controls, this field is not subject to rigid audits regarding specific information that can be entered. Custodial personnel can use the space in any useful manner to provide information as to specific container location (such as building column number in the process buildings, or "dolly" for containers on a wagon awaiting permanent storage positioning).

### 5.1.5 Accounts

A series of three-digit nuclear materials accounts exist for assignment of all nuclear materials. Three different generic types of accounts are used. These are **processing accounts**, **storage accounts**, and **clearing accounts**. Nuclear materials are assigned to only processing or storage accounts. The following information describes the purpose and use of these accounts:

1. Each account is assigned to a single NMMSS Reporting Identification Symbol.

2. A processing account is used to track and account for materials being physically processed. There are no true processing accounts remaining in DOE MBAs.

3. Storage accounts are established to differentiate between operational and programmatic uses of nuclear materials. Materials assigned to storage accounts are containerized. A single storage account may be located in several different MBAs. For example, F-cans containing uranium-bearing solids and assigned to the 911 Account (Waste Storage <20%) may be located in the Scrap Storage MBA or in the X-326L Hazardous Waste Storage MBA. Containers assigned to storage accounts may be located within a processing MBA or a storage MBA.

4. Clearing accounts are accounts established for proper functioning of the accounting system, or in other words, for "accounting purposes only." Nuclear materials at the plant do not reside within clearing accounts.

Appendix F-2 provides a listing of all nuclear material accounts. The NMMSS RIS station to which each account is assigned is also shown.

The X-345 LEU/HEU Storage MBA has one account previously used as a processing account for the High Assay Sampling Area operation (which has not been used for several years).

In addition to the processing account discussed above, Appendix F-2 provides a listing of the remaining storage and clearing accounts, which are not associated with a specific process or MBA. As stated above, material within any one of these accounts may be located within several different MBAs. The table also indicates the reporting station to which each of these accounts is assigned.

### 5.1.6 Material Codes

Material codes are three-digit symbols which are assigned to all nuclear materials to indicate chemical form or other useful information about the material, such as the intended use or class of $UF_6$ (tails, normal feed, etc.). Material codes also can be used to differentiate between DOE-owned and USEC-owned materials. Material codes for containers are very useful in quickly assessing the type of material in a specific container or in compiling computer generated reports of all items containing a certain type of material at the plant or within a specific location.

### 5.1.7 Assay Range Codes

Assay Range Codes are a series of two-digit codes which separate the possible range of isotopic assays (between zero and 100%) into thirty discrete ranges (e.g., assay range code 09 includes assays from 1.0000 to 1.9999%). During data entry into DYMCAS by NMC&A personnel, an assay range code is appended as a prefix to the material code to form a five-character code. The assay range code is primarily used as a sorting mechanism for data processing reports.

### 5.1.8 Container Prefix Codes and Container Serial Numbers

An extensive series of two-character container prefix codes (which may be numeric or alphabetic) exists. A container prefix code is appended to each nuclear material container serial number to indicate the type and size of the container. For some $UF_6$ cylinders not owned by DOE or USEC, the code indicates the container owner. Container prefix codes allow prompt identification of the container type and also are used within DYMCAS to automatically perform container tare weight audits (whether tare weight for container is within an expected range for the container type) to provide an added level of protection against data entry errors.

A unique container serial number is assigned along with the container prefix code to identify each discrete container, and in some cases, container ownership.

### 5.1.9 Project Numbers

For various programmatic activities and storage functions, DOE assigns ten-character project numbers. All nuclear materials are assigned to one of these project numbers. Project numbers may be assigned to any NMMSS reporting station.

### 5.1.10 Material Balance Report Dates

For each transaction input into the DYMCAS system by NMC&A personnel (assignment of measured values to container, change in container account, etc.), a Material Balance Report (MBR) date will also be input. This is a four-digit code which indicates the month and year of the transaction (e.g., 0502 reflects a transaction against accounting activity in May, 2002). This MBR date is very important in each month-end accounting system processing and closing cycle since the next month's activity continues on the data base as the previous month's activity is being finalized and closed out (e.g., input of sample analysis results for previous month's activity during the early days of the following month).

### 5.1.11 Container and Material Reject Codes

For programmatic purposes and container safety purposes, a series of reject codes exists to identify on the DYMCAS data base container reject conditions which need follow-up action (primarily related to $UF_6$ cylinders, which are coded pressure vessels) and to identify out-of-specification conditions or the presence of specific contaminants of concern in a container's contents (primarily related to $UF_6$ feeds and product).

### 5.1.12 Container Tamper-Indicating Device Numbers

A field exists on the DYMCAS database for the entry of a tamper-indicating device (TID) serial number when such has been applied to a container. Two additional fields exist for input of a second and third TID serial number for those instances in which additional TID's are associated with the container (as in the two vaults within X-345 where each container has an item TID applied and each storage hole may have a hole lid TID applied).

### 5.1.13 Measurement Data

The DYMCAS database contains fields for the entry of measurement data associated with each nuclear material container. These fields include the following:

1. Mass or volume values
   a. Units of measurement used
   b. Container gross weight, if applicable
   c. Container tare weight, if applicable
   d. Net weight or volume of contents

2. Uranium purity (relates to unit of mass or volume used above)

3. $^{235}U$ isotopic assay

4. Element (uranium) mass, in grams

5. Isotope ($^{235}U$) mass, in grams

Field personnel enter the accountability weights into the DYMCAS data base to improve the timeliness of accountability data. Redundant hard copy data transmission to the NMC&A group is provided, with this group validating these field entered values.

## 5.2 Dynamic Materials Control and Accountability System

The Dynamic Materials Control and Accountability System (DYMCAS) is the plant's official nuclear materials accountability system. This system utilizes remote stations in which data are input by field personnel and a check system by which those data are reviewed and validated by NMC&A personnel. All plant interaction with the DOE/NRC Nuclear Materials Management and Safeguards System is accomplished via a secure link between the plant and the NMMSS in Norcross, Georgia, as well as hard copy transmittal. DYMCAS is set up to meet DOE requirements for the recording and reporting of nuclear materials inventories and transactions for the plant to NMMSS, as contained in DOE M 470.4-6 "Nuclear Material Control and Accountability".

The DYMCAS data base and operating software are resident on the plant's central computer system with redundant central processing hardware features to enhance system reliability and on-line availability. DYMCAS user activities and access are subject to a system of user programmer project numbers (PPN), user passwords, user access to the system via locked terminal connection boxes, and user access to operating programs via individually assigned menus. As stated earlier, DYMCAS serves both field operations entry and NMC&A validation entry needs, and therefore, specific software packages are limited to each user as needed. DYMCAS features provide a record of the individual employee who enters each data element into the system and the time of entry. DYMCAS maintains a data base of all valid nuclear materials containers as well as the nuclear materials themselves.

The DYMCAS system utilizes a network of remote stations and data entry/access terminals located throughout the plant in areas where nuclear materials are processed, stored, shipped and received. The DYMCAS system is set up to permit a high degree of user inter-action, including on-line inquiry about specific near-real-time container data (including past track records of the movements, accountability value changes, and TID applications and removals for a given container) and ad hoc report generation from the up-to-the-minute container data base. The report generation features, for example, will permit a user with proper access to promptly generate a hard copy report which lists all five-inch cylinders (via container prefix codes) within the X-345 vault (via DYMCAS location symbols) which are assigned to the 979 storage account (via account number) and which contain $UF_6$ in the assay range from 92 to 94% (via setting report assay range limits).

NMC&A personnel validate transactions from field personnel. DYMCAS utilizes an authorization system which authorizes transactions for the movement of containers from their current location to a new specified location, or to perform a specific feed, withdrawal, or transfer operation for the container.

Each DYMCAS authorization is input into the system by NMC&A or Order Planner personnel. Each authorization has an authorized time window for the performance of the movement or processing activity, and each authorization generates a DYMCAS Transaction Report (TR), which is a hard copy document used by field personnel in carrying out the movement.

As authorized movements or processing steps occur, field users interact with the system. In the case of container movements between MBAs, specific DYMCAS packages are run by authorized personnel within the shipping MBA, and then by personnel within the receiving MBA. The shipper and receiver packages include verification of container serial number and, if applicable, container TID number.

The DYMCAS system utilizes an extensive audit table which defines the types or assays of materials which may be authorized to be moved to a specific plant location. Each authorization input into the system must clear the audit table check before being accepted by the system.

While timeliness of data input and processing is important, data integrity within DYMCAS is a greater concern. For this reason, NMC&A personnel function as the validators of the field entries. DYMCAS system field information from field activities reports indicating the receipt, shipment, movement, transfer, or processing of nuclear materials are received by NMC&A (via hard copy printouts from DYMCAS). These data are validated and augmented by other source documents (which are archived along with a DYMCAS report) such as weight tickets and completed sample transfer forms indicating sample analysis which relate to specific containers. The data are then certified and, in this manner, transaction data for a specific month's activity are accumulated for reporting to NMMSS.

In meeting its nuclear materials safeguards objectives, reports are keyed on nuclear materials accounts, material codes, and measurement data for individual containers. To meet the various other nuclear materials management objectives, DYMCAS keys on NMMSS reporting stations (via account numbers) and project numbers as well as container measurement data. All changes on DYMCAS to material quantities within nuclear material containers are in some manner reflected by transactions against other containers, against processing accounts, or against plantsite shipments or receipts, consistent with commonly accepted practices for a double entry accounting system.

### 5.3 Coordinated Use of DYMCAS for NM Accounting

Physical inventories of all nuclear materials containers and processing systems are conducted on a material balance area basis (see Appendix E-2 for the inventory frequency for each MBA). The container inventories taken in each MBA are reconciled against the DYMCAS database, based on the current DYMCAS system information of all containers located in the specific MBA. Also, confirmatory measurements performed on a statistical basis during a given inventory period, on a location basis, are compared with the DYMCAS accountability values for each selected container to confirm its contents.

The required certified reports to NMMSS and to the DOE-ORO MC&A/IS Branch Chief are prepared, audited, and transmitted using DYMCAS system programs and based on the nuclear material inventory data contained on the DYMCAS data base. All such reports are certified by the authorized DOE Nuclear Materials Representatives. In this manner, the data base is used in an integrated manner to account for both containerized and in-process materials and to reconcile physical inventories against official book records.

### 5.4 DYMCAS Administration

DYMCAS is administered by the NMC&A Group. They are responsible for coordinating efforts associated with the upkeep and improvement of the DYMCAS hardware and software. NMC&A is responsible for interfacing with the Corporate Information Technology organization and Maintenance personnel to resolve any problems that may occur. They serve as a point of contact for field personnel utilizing DYMCAS. NMC&A personnel assure only those individuals who are required to have DYMCAS program menus do indeed have those menus and only those software packages needed are assigned to these individuals. They are also responsible for maintaining a current listing of all DYMCAS stations.

In the event that the DYMCAS system is inoperative, NMC&A will assess whether field transactions should be continued using paper documentation. Specific procedures have been developed and would be implemented to handle this situation.

### 5.5 Shipments and Receipts

All accountable nuclear materials and nuclear material containers (except waste materials) shipped from and received at PORTS are scheduled and controlled by Order Planners or by NMC&A. Shipment of DOE waste materials is coordinated through the LPP Waste Management group.

The majority of DOE nuclear material flows at the site involve scrap and waste materials. These include shipment of low level wastes to storage/processing facilities, receipt of materials as part of the DOE Uranium Management Center, and an occasional receipt of relatively small quantities of $UF_6$ or non-$UF_6$ materials from other DOE facilities.

#### 5.5.1 Shipments

For shipments of accountable containers off site, Order Planners or NMC&A are notified and requested to prepare a shipment authorization on DYMCAS. The authorization provides information to NMC&A accounting personnel and uranium materials handlers regarding the material to be packaged and shipped. D & D personnel schedule the packing and loading to coincide with the transporter arrival.

Custodian personnel within the shipping MBA ensure that items shipped are only those indicated on the shipment authorization. They verify (with support from Packaging and Transportation personnel) that labeling, placarding, inspections, and safeguards measures are completed prior to releasing the material to the transporter. D & D personnel process the shipment and run additional DYMCAS software packages (e.g., "Shipment Pack" and "Shipment Load") at the time the shipment departs. The completion of the "Shipment Load" package signals NMC&A that the material has been shipped and DYMCAS is updated. NMC&A then prepares and issues a DOE/NRC Form 741, "Nuclear Material Transaction Report".

Shipments of accountable LEU materials may be processed through the X-344 facility, as a "shared site" operation with USEC. Accountable containers of HEU materials (e.g., oxides) are shipped from the X-345 storage facility. After assuring that all documentation is signed and approved, the shipment is released to the transporter.

Shipments of uranium-bearing waste materials in non-accountable containers (e.g., those that have been written off of the accounting records to the VXA station) are coordinated by the LPP Waste Management group. They schedule the shipment, arrange transportation, load the shipment, and document the transfer. Waste Management personnel provide a facsimile of shipment information to NMC&A within one working day of departure. The information identifies items which have been shipped and quantitative data for uranium and $^{235}U$. NMC&A prepares and issues a DOE/NRC Form 741 documenting the shipment.

### 5.5.2 Receipts

Notice of a forthcoming receipt is communicated to Order Planners or NMC&A in one of several ways: (1) arrival of the shipper's notice in advance of the receipt, (2) telephone, facsimile, or E-mail notice of a forthcoming receipt, or (3) inquiry by plantsite personnel pertaining to status of expected movements.

Details of materials moving to PORTS are then solicited from the shipper in terms of identification of containers, materials, carrier, estimated time of arrival, purpose of the shipment, vehicle numbers, etc. This information is used to prepare documentation which is forwarded to Security, the Plant Shift Superintendent, and uranium materials handlers, as necessary, to verify the arrival of the materials.

#### 5.5.2.1 Nuclear Material Receipt Authorization

Upon notification of an impending receipt, the Order Planner or NMC&A creates a receipt authorization on DYMCAS. This authorization includes the identity of the containers, and quantity, assay, and tamper indicating device information.

### 5.5.2.2 Inspections and Documentation

Upon receipt and unpacking of materials, information is entered into DYMCAS. In addition to inspection for damage, defects, and leakage, weight measurements are made (if required) for comparison to shipper's weights to ascertain if an established shipper/ receiver difference control limit is exceeded. Container defects are noted and, if necessary, a reject code is applied to the DYMCAS record, a reject tag is placed on the cylinder, and a reject report is generated.

Completed inspection reports and additional information, such as packing lists received with the materials, are checked for accuracy by the receiving group and forwarded to NMC&A. NMC&A prepares a DOE/NRC Form 741 documenting the receipt of the material.

## 5.6 Nuclear Materials Transaction and Processing Reporting

Reporting of field transactions and data processing outside the NMC&A Group is accomplished by submission to NMC&A of completed forms or completed DYMCAS transactions for material transfers, sample transfers, shipments, receipts, and feeds or withdrawals. NMC&A processes the DYMCAS transactions to update accountability databases.

### 5.6.1 Routine and Miscellaneous Intra-RIS Transactions

Routine Intra-Reporting Identification Symbol transactions are those that are between plantsite accounting areas under the same Reporting Identification Symbol and which are not reportable to the Nuclear Materials Management and Safeguards System. A visual audit of DYMCAS or forms data is performed by NMC&A prior to submission to DYMCAS. If accountability data are not available, the system holds the transaction in a suspense file pending further data entry. If an error is detected, the transaction is rejected and reported to NMC&A on an error report. NMC&A can then supply additional information correcting the error.

Every transaction successfully captured by the system will be entered into the transaction balance by removing the material from one account and adding it to another as indicated on the transaction record. If the transaction involves a container, the DYMCAS data base is updated by NMC&A personnel to reflect all pertinent changes.

Miscellaneous Intra- or Inter-Reporting Identification Symbol transactions are entered by use of a transaction journal sheet from NMC&A except as noted in section 5.6.2 below.

### 5.6.2 Inter-RIS Transactions

Transactions involving material transferred between RIS stations when one is off plantsite require the generation of a DYMCAS Authorization using other forms to record the transaction as described in section 5.5. Information from the DYMCAS Authorization is used by NMC&A to update DYMCAS and to generate a DOE/NRC Form 741 to report the transaction to NMMSS.

When the Inter-RIS transactions involve two PORTS stations, the transactions are handled as for Intra-RIS activities, except a DOE/NRC Form 741 is prepared and transmitted to identify the transaction to NMMSS. When the non-recoverable waste streams are involved (to the VXA station), summarized totals of accountable material content are used to report the transaction to DYMCAS and to NMMSS. Transfer to these disposal accounts terminates the active record of any involved containers on this system and the DYMCAS system. An archive file is generated as a result of these transfers.

### 5.6.3 Journal Sheet Transactions

Journal sheet transactions are used to reflect changes in uranium inventories which cannot be tracked by container or cylinder or which are not amenable to the normal reporting mechanisms. NMC&A generates Journal Sheets from field supplied data which are certified as correct before submission to DYMCAS. Data for these transactions are acquired by DYMCAS or field-entered forms reporting. Journal sheet transactions are generated for the following:

a. Crossovers - adjusts NMMSS range balances (depleted, normal, low enriched, and high enriched) when material assays are mixed resulting in a crossover of these range balances.

b. Internal project changes - adjusts material transferred from one project number to another due to operational or administrative change. Reporting to NMMSS is satisfied by this journal sheet but a DOE Form DP-749, Transcription Sheet, is also prepared by NMC&A.

c. Revisions or corrections - if previously submitted DYMCAS data are found to be erroneous and affect the material balance records, a Journal Sheet is prepared by NMC&A to accomplish the necessary changes.

### 5.6.4 Completing Month-End Closing

The current deadline for completing month-end closing of material transaction balances is the eighth working day of the following month. NMC&A prepares a schedule to meet the deadline which generally follows a sequence for submission of field data and subsequent reviews prior to certification. Based on prior data transmission from DYMCAS, NMMSS generates a series of reports near the end of this closing cycle, indicating all transaction balances.

#### 5.6.4.1 Transactions Dependent on Physical Inventories

Physical inventories in forms or DYMCAS report format must be received by NMC&A on the first working day following the closing month end. Other balance calculations are dependent on this data being entered.

#### 5.6.4.2 Closing Cross Station Transactions

Closing of cross-station Reporting Identification Symbol accounts requires that all transfers creating a DOE/NRC Form 741 be processed and all storage balance inventories be satisfactorily updated before the balance can be certified as final. Completion of these activities clears the system for generation of a final closing report.

### 5.6.4.3 Completing Inventories

Physical inventories which are reported as non-transaction dependent or static are processed for entry into DYMCAS after all transaction balances have been completed. The deadline for this inventory reporting is the fifteenth day following the month ending or the first working day following a weekend containing the fifteenth day. Upon completion of this reporting and submission of certified data from reconciliation reports, the Total Plant Inventory Listing is generated by the 21st day following the month end. This listing is the entire data base and is a combination of inventory updates and perpetual inventory records maintained on DYMCAS subject to verification procedures. This report is transmitted over the data-link to the DOE Nuclear Materials Management and Safeguards System.

### 5.6.5 Nuclear Materials Management and Safeguards System Reports and Reconciliation

A day is set aside after the eighth work day of the month transaction balance closing to correct input to NMMSS which did not pass software editors. Several days after submission of this data, PORTS receives, over the data-link, the following three reports from NMMSS:

A-210, Monthly Project Material Balance

This report shows a material balance for each Reporting Identification Symbol in broad range balances of depleted, normal and enriched categories. When the transaction input to NMMSS is identical to the input to DYMCAS, the book balances should be in agreement. Differences will become reconcilable items.

TJ-45, Transaction Journal

This report has the same data as A-210 but in different format. Transactions are listed in DOE/NRC Form 741 number order with total receipts following total shipments. It shows no book balance.

MSR-742, Material Status Report

This report is a material balance report in summary form in the broad range balance categories in each Reporting Identification Symbol. Three copies of this report are transmitted. One copy is completed with reconciling notes and signed by the Nuclear Materials Representative, or alternate, for DOE reporting.

One week after the complete inventory is sent over the data link to the Nuclear Materials Management and Safeguards System, the system sends back the following two reports dependent on completed inventories:

I-27, CIDI Ending Inventory

This report contains a summary for each Reporting Identification Symbol by Category of Inventory Data Information format. DYMCAS prints a similar report for local use.

A-200, Summary Ending Inventory

This report compares book inventories resulting from project transactions and Composition of Ending Inventory and prints the differences. These differences are reconciled with ID's (inventory differences) in DYMCAS.

### 5.6.5.1 Reconciliations

When both the NMMSS and DYMCAS databases have the same ID's, it is necessary only to correct both systems using Journal sheet and transcription reporting methods. A difference between systems requires reconciliation of the ID, which is usually caused by an incorrect entry in DYMCAS. All reconciliation data are noted on the MSR-742 form and on a Facility Control Data reporting form, which is completed and sent with the reconciled MSR-742 Material Status Report to the DOE-ORO MC&A/IS Branch Chief.

## 5.7 Physical Inventory Requirements

Physical inventories are performed on a material balance area basis, according to an established frequency for each MBA. This information is presented in section 4.0. For each inventory period, the MBA Representative and supporting custodian personnel coordinate the performance of the physical inventory with the NMC&A Support Person for the MBA and with any other required supporting groups. Each MBA Representative is responsible for assuring that a high quality physical inventory is taken in his/her MBA and for assuring that all required inventory forms are submitted to NMC&A in a timely manner.

Physical inventories consist of performance of static container inventories for each MBA. Static container inventories are recorded on Forms A-1642 or A-1642A (Nuclear Material Container Inventory), and are submitted to NMC&A, where the forms' data are reviewed for completeness, legibility, etc. The forms are then submitted to Corporate Information Technology for data entry.

Reconcilable reports are generated from the comparison of the physical inventory data with the DYMCAS container database, and the NMC&A Support Person investigates all reconcilable entries with the assistance of the MBA Representative and other custodian personnel within the MBA. Those items containing nuclear materials that cannot be reconciled within specified periods of time, based on the graded safeguards concept, are considered unaccounted-for items and reported to the Manager, NMC&A. Further efforts are initiated including, but not limited to security investigations.

If the unaccounted-for item is not found or reconciled, it is declared a missing item and is reported to DOE as outlined in DOE M 470.4-1, Section N.I.3. If during any part of the reconciliation process there appears to have been a malevolent act committed, the Manager, NMC&A, will be notified immediately so the proper notification can be given to DOE consistent with DOE M 470.4-1 Section N. Techniques used in the reconciliation and reporting processes are described in NMC&A procedures.

### 5.7.1 Inventory Measurements

Quantities of uranium and $^{235}U$ in each container of nuclear material are based on measured values. During each inventory period, confirmatory measurements are performed on a number of containers to provide assurance that accounting records are correct. Certain items are exempt from confirmatory measurement requirements. Items that are exempt include:

- **Items containing less than 200 grams** $^{235}U$ This threshold is consistent with DOE reporting criteria of greater than 200 grams of fissile material for shipper-receiver differences, as listed in DOE M 470.4-1 Section N, "Reporting Incidents of Security Concern".

- **Items of source material**, i.e., items containing depleted and normal uranium.

- **Items containing uranium enriched to less than 2 weight percent** $^{235}U$ A confirmatory measurement threshold of 2 weight percent $^{235}U$ has been established by the DOE/ORO. Confirmatory measurements of items containing uranium enriched below this level are not required as part of the physical inventory process. Establishment of this threshold is consistent with guidance provided in Section II.3.d.(1) of DOE M 470.4-6.

- **Large $UF_6$ cylinders.** Solid $UF_6$ contained in large $UF_6$ cylinders cannot be easily removed through ordinary means. Specialized equipment, including cylinder carriers, straddle buggies, and autoclaves to liquefy the cylinder contents are required.

- **Batched items in DMSA-12.** DMSA-12 contains a large number of B-25 storage boxes that each contain a number of miscellaneous uranium-bearing items. Various small process components, such as piping, valves, seals, instrument lines, etc. were measured individually using NDA techniques then batched into a B-25 box. The inventory of uranium and $^{235}U$ in each box is the sum of the individual measurements. The maximum $^{235}U$ in any box is 350 grams. Accurate confirmatory measurements are not possible unless the boxes are opened and the individual items measured separately.

For the population of items subject to confirmatory measurements, a statistical sampling plan is used to select specific items to be measured. The sampling plan provides 95 percent confidence that a defect level of 10 percent or more would be identified by the sample. Items are stratified based on their storage location and the container or material type. For example, uranium oxide materials stored in the X-744G facility form a single stratum from which to select a statistical sample of containers. At least 10 items are measured from each stratum, unless the stratum contains fewer than 10 items, in which case each item is measured.

Measurements performed on the items include container gross weight, solution volume, or an NDA quantitative measurement, as appropriate for the type of item. Acceptance/rejection criteria are based on statistical propagation of measurement variances, and are documented in implementing procedures. Confirmatory measurement results that are outside acceptable limits are investigated as described in Section 8.1.4.

## 5.8 Discards and Writeoffs

Scrap and waste nuclear materials which contain very low levels of uranium may be discarded if certain criteria are met. Per DOE M 470.4-6 requirements, SNM must meet the definition of Attractiveness Level "E" to terminate safeguards. Requests to dispose of higher attractiveness level materials must be submitted to the appropriate DOE program office and the DOE Office of Safeguards and Security.

Attractiveness Level "E" materials may be discarded with approval of the operations office manager. For DOE-owned materials, approval of the DOE Portsmouth Site Office Manager is required. Various scrap and waste materials are routinely encountered at PORTS. These are listed in Appendix G along with limits approved for discard. Materials of these types that meet the definition of Attractiveness Level "E" may be discarded and removed from plant accountability records following approved procedures. Requests to discard these materials should be forwarded to NMC&A personnel who will make the appropriate authorization if the material is determined to be discardable. DYMCAS transactions will indicate the material going to a discard account. NMC&A personnel will then make the appropriate book entries to remove the material from the accountability ledgers.

Writeoffs of nuclear materials outside the above discard limits require special approval of the DOE-ORO MC&A/IS Branch Chief. Writeoffs of material usually occur when there has been an accidental loss of SNM or other non-routine activity. Once approval is obtained, writeoffs will be properly documented using journal entries and source documents. All records will be retained for audit purposes.

Any item that is outside a material balance area and that is determined to contain quantities of uranium above approved discard limits must be returned to accountability. The item must be transferred back into a material balance area within 10 calendar days of such determination. Examples of such transfers include materials that were previously written off the accounting records and are being returned for processing, or materials that are discovered to be above discard limits based on a re-measurement obtained subsequent to having discarded the material. If mitigating circumstances (e.g., nuclear criticality safety concerns) prohibit accomplishing a transfer within 10 calendar days, DOE approval must be obtained to leave the item outside of an accountability area.

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# 6.0 MEASUREMENT PROGRAMS

A well-established measurement program is a necessary part of an accurate material control and accountability system. This section describes the measurement techniques and systems in place at PORTS to obtain accurate accountability values for uranium materials. Details of specific measurement processes can be found in individual operating procedures.

## 6.1 Responsibilities

Responsibilities for measurements and measurement control are shared by USEC and LPP personnel. Field scale operations, volume measurements and sampling within DOE MBAs are performed by LPP personnel. Destructive analytical measurements, NDA measurements and scale calibrations and maintenance are provided by USEC or other approved vendors through contractual agreements. Measurement control over-site is provided by the USEC NMC&A group through a government furnished service contract.

## 6.2 Mass Measurement

### 6.2.1 Scales and Balances

Scales and balances are used extensively throughout plantsite to provide mass values for containers of uranium-bearing materials. Depending on its application, a scale may be used for obtaining initial tare weights of containers, rough "production" weights of in-process materials, final book accountability weights, or confirmatory weights used for audit/assurance purposes. The two types of scales used to obtain weights for these different applications are described below:

Accountability Scales - These scales are used to provide final accountability weights to the DYMCAS data base. They are maintained under a rigorous calibration program and have narrow tolerances which are tightly controlled. A check weighing program is used during operation of these scales to monitor their performance. Material receipts which require weighing are weighed on these scales to determine their official accountability weight. Likewise, all containers that require weighing prior to being shipped off plantsite will be weighed on an accountability scale. Accountability scales should be used when the net weight is used to calculate the reported U and $^{235}U$ content of an item.

Production Scales - These scales are used at various facilities to obtain interim "rough" weights during material processing. Generally, these values will be very good, but not as tightly controlled as the designated accountability scales. Calibrations are performed on production scales on a routine basis. Additionally, production weights are compared to eventual accountability-quality weights by NMC&A to monitor their performance. If an unacceptably large difference is observed, maintenance is requested on the production scale. Production scales may be used when the reported $^{235}U$ content is determined by NDA techniques and is thus not dependent on net weight.

Confirmatory weights may be obtained on either an accountability scale or a production scale.

NMC&A maintains a current listing of all scales and balances used for measurement of uranium materials.

### 6.2.2 Mass Standards

A variety of standards are used in the mass measurement program, all of which are traceable to units of mass at the National Institute of Standards and Technology (NIST). These items range in size from conventional laboratory fractional gram standards to 500-Kg. blocks used on large accountability scales. These standards provide the necessary range to calibrate any accountability or production scale throughout its range.

The Scale Shop maintains all mass standards required for calibration of equipment used for accountability measurements. Primary standards of 500 Kg or less are returned to NIST on a periodic basis (typically every ten years) for recertification. The mass value established for the standard is documented by NIST along with an estimate of the random and systematic error associated with the assigned value. The primary standards are then maintained in the Scale Shop under controlled conditions.

Secondary mass standards are created and checked in the Scale Shop using double substitution techniques and modified double substitution methods per NIST Handbook 145 procedures. Highly sensitive balances in the Scale Shop are used to compare the secondary standards to the primary standards. Control weights are used to check the balance prior to use. The secondary mass standards are then used in the field to calibrate accountability equipment. Secondary standards are recalibrated on a routine frequency, typically annually.

Artifact standards are available and used for the smaller cylinders on plantsite. Standards exist for 5", 8" and 12" cylinders typically used for higher assays of $UF_6$ materials. These standards are calibrated against primary standards in the Scale Shop, but are not sent to NIST for certification.

Small analytical mass standards are maintained in the X-710 Laboratory by Lab Services personnel. These standards are verified against primary standards every three years.

Listings of all primary mass standards are kept by Scale Shop personnel who monitor the recalibration requirements and send standards to NIST as required. Listings of primary and secondary mass standards, including calibration schedules, are maintained on file by NMC&A personnel.

### 6.2.3 Scale Calibration and Maintenance Programs

All scales and balances, with the exception of X-710 Laboratory analytical balances, are calibrated and maintained by Scale Shop personnel. Routine maintenance and calibration is performed on an annual basis (11-13 month intervals) and is scheduled through the plant's computerized preventive maintenance system. This schedule is overseen by NMC&A personnel to assure that it is followed. Scales used by the shop to establish in-house standards are calibrated before each use and not on any set periodic basis. Maintenance is also performed on a non-routine basis whenever an out-of-tolerance check weighing occurs, or after some other unusual event. An audit of the scale's performance is conducted after specific maintenance activity, identified by the Scale Shop, which could affect scale performance. An audit consists of a series of special weighings using available standard weights. It is performed by field personnel and may be witnessed and/or reviewed by NMC&A personnel to validate the scale operation.

Scales are calibrated in a step fashion by adding block weights throughout the range of the scale and noting the scale reading after each addition. The block weights are then removed in step and the scale readings are again noted. The readings must be within a specified tolerance over the entire range of operation. This method assures linearity throughout the range of the scale. The process may be repeated several times to verify reproducibility and accuracy of the readings.

Records of scale calibrations are maintained in the Scale Shop, with copies forwarded to NMC&A. Calibration stickers are applied to each scale after calibration and checked by field personnel prior to taking accountability weights.

Small balances used by the X-710 Laboratory for analytical purposes are calibrated by an approved vendor. Lab Services personnel are responsible to assure that these balances are calibrated at specified frequencies. Records of these calibrations are monitored by NMC&A personnel.

### 6.2.4 Daily Scale Operations and Check Weighings

A check weighing program is implemented on accountability scales to provide assurance that the scale is operating properly. This is accomplished by weighing in-house standards each shift that the scale is in use. Additional weighings may be performed during the shift if there is some question about the scale's performance. Scales are checked at two or more points throughout the range of intended use to assure linearity. A print weight ticket of the scale zero and the IHS weights is made and forwarded to NMC&A to document the accuracy of the scale.

A continuing record of the scale check weight values is maintained by NMC&A personnel to monitor the performance of the scales and detect any drift in the operation. Whenever a check weighing results in an out-of-tolerance value, all containers weighed during that time frame are subject to a verification weight to assure accuracy.

### 6.2.5 Scale Tolerances

Allowable tolerances are established for each accountability scale used on plantsite. These tolerances reflect the accuracy and repeatability expected for measurements obtained on each particular scale. Tolerances are based on historical capabilities observed for the various scales and the potential errors in the established primary and secondary mass standards.

Tolerances for each scale are documented in the listings kept by NMC&A.

## 6.3 Laboratory Analytical Procedures

The accurate determination of uranium concentration and $^{235}U$ assay are of prime importance to a nuclear materials accountability system. The responsibility for carrying out these measurements lies in the Lab Services organization. Well-established and well-characterized analytical techniques are utilized to provide accurate measurements on a variety of uranium-bearing materials. This section will briefly describe the systems and controls in place to provide these measurements. More detailed discussions of the specific procedures can be found in laboratory analytical procedures. These procedures are reviewed by the NMC&A Measurement Control Coordinator prior to issuance.

### 6.3.1 Uranium Purity Measurements

Uranium purity is determined by measuring the grams of uranium per gram of sample material, or per liter of sample solution. Materials submitted for analysis can be in a variety of forms, including $UF_6$, uranium oxides, UNH, contaminated trapping materials, solutions, and various other uranium-bearing substances. The method of analysis is selected based on material type to give the most accurate uranium accountability result

### 6.3.2 U-235 Assay Measurements

The isotopic assay of uranium materials in terms of weight percent $^{235}U$ is determined using several methods. Gas mass spectrometry is used to provide highly accurate values for $UF_6$ materials. A double standard technique is used where the sample is measured relative to two known standard materials, one at a higher assay and the other at a lower assay. For relatively impure materials, a gamma counting technique or other approved method may be used to determine the $^{235}U$ to total uranium ratio. These various techniques have differing levels of accuracy and precision, but all are used with standard reference materials to provide measurement controls.

### 6.3.3 Measurement Control Programs

To insure the reliability of analytical procedures used to determine uranium accountability analyses, Lab Services personnel routinely introduce control samples into the procedures. Results of these control samples are statistically analyzed to determine the reliability of the analyses. Primary standard reference materials are used in conjunction with uranium materials traceable to the DOE New Brunswick Laboratory to calibrate secondary standards. Secondary reference standards are used to calibrate uranium standards using procedures based on NIST approved methods with established accuracies.

In addition to statistical monitoring and trending of control sample analyses over a period of time, each analytical technique uses specific controls to validate performance of the measurement system prior to conducting sample analyses. If results of the control samples fall outside acceptable ranges, the analyst follows specific procedures described in the laboratory analytical procedures manual to report the condition and correct the situation before proceeding with analytical measurements.

## 6.4 Nuclear Materials Sampling

The accountability system at PORTS is based to a large extent on samples of materials which are withdrawn from containers or processing systems. Many different sampling techniques and approaches have been developed to obtain samples which are representative and adequately describe a material flow or discrete item. Documented procedures are reviewed and approved by the NMC&A Measurement Control Coordinator. This section will describe the sampling techniques used for the major accountable materials as well as for the significant routine flows which occur on site.

### 6.4.1 Pure Uranium Compounds

Typically pure uranium compounds at PORTS are oxides which are generated in the X-705 facility. These oxides are sampled by USEC personnel under a contract with LPP to process DOE material. Oxides generated at the X-705 are produced in "Z" cans (approximately 5" x 15" metal cans) containing about 10 Kg. of material.

The cans are placed on a roller device to homogenize the contents as much as possible. Samples are then obtained by pulling a grab sample from the container in a sealed glove box. This sample is then further homogenized at the laboratory and destructive analyses are made to determine purity and assay.

In addition oxides or UNH may be received from off-site for storage at PORTS. If sampling of these items or items already in storage was required, LPP would perform the sampling using a sampling plan approved by the Manager of NMC&A and approved sampling procedures.

### 6.4.2 Solid Scrap and Waste Materials

Many containers of scrap and waste materials are generated on plantsite as a result of chemical trapping operations, decontamination activities and laboratory activities. These materials are typically relatively impure and may be of a heterogeneous nature. Special sampling/analytical techniques are required to obtain good accountability of the uranium in these items.

Solid scrap waste materials include alumina, sodium fluoride and magnesium fluoride pellets. These items are usually lightly loaded with uranium at a $^{235}U$ assay which is common to the location in the cascade in which they were used. Due to the heterogeneous nature of these materials, grab sampling techniques do not necessarily provide a representative sample of material. For this reason, the $^{235}U$ content in these items is measured using a non-destructive assay instrument. This system is described in Section 6.7.1.

### 6.4.3 Solutions

Uranium-bearing solutions originating from the laboratory and other activities are sampled and analyzed by wet chemistry techniques to determine uranium content and assay. The solutions, typically in 5" x 48" polybottles, are mixed for 15-20 minutes using an electrical mixer or air bubbler to assure homogeneity. A solution sample is then obtained and sent to the laboratory for analysis.

## 6.5 Volume Measurements

Volume data are used to determine accountability values in solution containers. The only containerized materials for which volumes are used to determine accountability values are solution polybottles and drums. Since these containers may not be full, calibrations have been performed on the length of the containers and charts have been developed to correlate solution height with container volume. A measurement of this type is made whenever uranium-bearing solutions are entered onto the accountability system.

## 6.6 Non-Routine Operating Losses

Infrequent, non-routine or accidental losses occasionally occur due to some malfunctioning equipment or mis-operation. In these cases, personnel from NMC&A evaluate the situation and determine if special sampling or measurements are necessary. Where possible, any uranium materials involved in these losses will be measured by gathering solution samples, etc. In those cases where the uranium cannot be measured, an estimate will be made using best available engineering data, including material balances before and after the occurrence. These estimates are documented in the files of NMC&A, written off the DYMCAS accounting records, and reported to DOE.

## 6.7 Non-Destructive Assay Measurement Systems

Non-destructive assay (NDA) measurement systems are used to generate accountability data for a number of purposes. Some of these measurements result in direct input to the DYMCAS records; others are used for confirmatory purposes. These systems are described below.

### 6.7.1 Low Density Waste Assay Monitor (LDWAM)

USEC personnel operate a Low Density Waste Assay Monitor (LDWAM), which is a NDA device used to provide accountability measurements on small diameter containers, 55 gal drums and other items containing low density, heterogeneous materials. Because the materials are heterogeneous in nature, it is difficult to assure that a grab sample would be representative of the entire container. For this reason, a direct measurement of the container contents is taken to provide a more accurate accountability value.

The LDWAM consists of a high purity germanium detector coupled to a dedicated computer system which controls the operation. A container of material is placed on a rotating platform which automatically moves up and down across the detector during a measurement cycle. Lead shielding is used around the detector to reduce interference from background radiation. A transmission source is located across from the detector and is used to ascertain the density of the material. Materials which are too dense compared to standard materials, and therefore, likely to be heavily loaded with uranium compounds, cannot be accurately measured using this technique and are rejected by the system. These containers are then sampled to provide accountability values.

The material is scanned across each segment of the can over an approximately 45-minute time period. The system measures the $^{235}U$ gamma radiation emanating from the material and converts this reading into a quantitative value of $^{235}U$ in the can based on standards which are used for calibration. An assay value is determined based on the location from the process where the material originated and is used to calculate the quantity of total uranium in the material. These sampling or other NDA measurement data values are then placed on the accountability data base by personnel in NMC&A.

A check standard is run on the system each shift the LDWAM is in operation to verify that the machine is operating properly. Additional calibration standards are run on a periodic basis to ensure that the system is providing accurate output over its entire range of operation. A measurement control program is in place to provide confidence in the accountability values which originate from this system.

### 6.7.2 In-Process Holdup Measurements

In-process holdup measurements are made for accountability purposes in three applications: the shutdown X-705 Oxide Conversion facility, the X-345 HASA process system, and on shut-down equipment in X-326. A sodium iodide or high purity germanium detector coupled to a multi-channel analyzer is used to estimate the quantity of uranium retained in these areas as well as in the associated piping.

In 1991, a program was initiated to suspend production of high enriched uranium in the cascade. Significant portions of X-326 have been shut down and have undergone in-place chemical treatments to remove excess HEU deposits. As part of the deposit removal verification process, NDA measurements were taken at various points within a cell. Typically, gamma and/or neutron readings were collected above each compressor, cooler, and converter. Estimates were made of the remaining $^{235}U$ holdup in the system. The uncertainty associated with existing NDA technology for these measurements has been estimated to be ± 50%.

### 6.7.3 Other NDA Systems

Additional NDA equipment is currently in use by USEC to provide accountability and confirmatory measurements on uranium containers and items. Portable instruments may be used in the field to perform audits of $^{235}U$ assays on $UF_6$ cylinders and other containers. These instruments consist of sodium iodide or high purity Germanium detectors coupled to a multi-channel analyzer.

A portable NDA cart is used to perform accountability measurements on containers of materials. Consisting of a High Purity Germanium (HPGe) detector, lead shielding, a rotating platform, and a multi-channel analyzer, the NDA cart is used to determine the quantity of $^{235}U$ in small diameter containers of low density nuclear materials. The measurements are booked as accountability values on the NM database. Due to the low concentrations of uranium present in these low density materials, no attenuation source is necessary to establish accurate values.

For items that can not be measured on the portable cart (too large for turntable or in-situ) field portable quantitative systems may be used. When the item wall is sufficiently thin to permit transmission, the item can be measured via a gamma-ray measurement system. If possible, transmission measurements are made in conjunction with the quantitative measurements to allow for attenuation corrections. For items with thick walls, dense matrices or high uranium content measurements may be performed with neutron slab detectors.

USEC personnel operate a Californium Shuffler , which uses active and passive neutron techniques to provide accountability measurements on a variety of scrap and waste materials in 55-gallon drums, including alumina, scrap metals, floor sweepings, and miscellaneous other materials.

6.8 Contractor Measurement Services

LPP is responsible for DOE material and works with USEC personnel to maintain control and accountability of this material. LPP may elect to have approved vendors perform various accountability measurements either on-site or through vendor labs. Measurement values must be documented and reported to NMC&A for inclusion in the accountability records. Documentation must include the vendor providing the service, the system used, along with the reported values.

Any contractor supplying measurement services is reviewed to ensure that measurement control systems are in place and these systems are adequate to meet the requirements of this plan. This review will include the training of contractor personnel, procedures used, documentation of measurement control program, estimates of precisions and accuracies, traceability of standards to nationally recognized standards, the quality assurance program and any other requirements necessary to insure that the measurements obtained from the approved vendor would be acceptable for NM accountability measurement purposes.

Copies of traceability documentation must be provided to the MCC.

**6.9 Selection, Qualification, and Statistical Characterization of Measurement Methods**

NMC&A has the overall responsibility for controlling the selection, qualification, and statistical characterization of measurement methods used at the plant for nuclear materials accountability purposes. Subordinate responsibilities in this area rest with Lab Services (for destructive and non-destructive analyses of nuclear materials), with field personnel (for mass measurement, volume measurement, and materials sampling methods) and with approved vendors (for contracted measurement services).

The methods in each of these areas that are presently in use at PORTS by USEC have been developed over the lifetime of the plant operation and in most cases are very well suited to the specific application. All methods are reviewed by the NMC&A Measurement Control Coordinator to assure they maintain the necessary standards.

Selection and qualification of confirmatory measurement methods for nuclear materials is also under the control of the NMC&A Measurement Control Coordinator. The selection of methods is based on the graded concept and takes into account the cost and feasibility of performing the measurements quickly and efficiently. NMC&A approves the recommended methods as documented in confirmatory procedures for specific classes or locations of nuclear materials inventories.

As stated earlier, confirmatory measurements are made on a graded safeguards basis on items stored in various MBAs. Confirmatory measurements are taken on a statistical sample size of containers in the storage area using accountability scales, production scales, and/or confirmatory cart instrumentation, which consists of gamma detectors and multi-channel analyzers. These values are compared to previous readings and/or DYMCAS values and reported to NMC&A. Frequencies of these confirmatory measurements are determined by NMC&A in coordination with LPP and are no less frequent than those required by DOE orders.

### 6.10 Measurement Control Coordinator

A Measurement Control Coordinator is designated from the NMC&A Group. This individual has the following responsibilities:

1) Providing support to Statistical Services personnel in the development and application of variance propagation techniques to nuclear material measurement data.

2) Developing tests for generating measurement uncertainties associated with sampling and analysis procedures.

3) Maintaining measurement control documentation, including traceability of standards, bibliography of procedures, calibration frequencies and operational check requirements.

# 7.0 MATERIALS CONTROL

Since PORTS stores and processes nuclear materials at widely varying isotopic assays and attractiveness levels, the use of a graded program for material control and physical security is important to differentiate among the various potential threats and material targets. Some material control measures are the same for most or all material types and situations, and other measures are specific to highly enriched uranium.

## 7.1 Access Controls

### 7.1.1 Material Access Areas/Protected Areas

Category I or II quantities of SNM are no longer stored, processed, or handled at PORTS. Programs to complete removal of significant quantities of HEU materials were completed in CY 2000. The Protected Areas and Material Access Areas that were in place previously around the X-326 and X-345 facilities are no longer in effect.

### 7.1.2 Access Controls to Other Areas

Access to other plant areas where high enriched, low enriched, normal, and depleted uranium is stored and processed is controlled by custodian personnel. Access to specific areas (e.g., some Category III areas) may be augmented by Protective Force personnel as necessary. Where feasible, areas containing Category IV quantities of materials (such as the X-744G Warehouse) are locked when unoccupied by custodian personnel. Outdoor storage lots are enclosed within the perimeter fence and are subject to patrols by Protective Force personnel.

## 7.2 Material Surveillance and Containment

There are no individual discrete items that contain a Category I, II, or III quantity of SNM. Those MBAs that contain a Category III quantity of material involve a large number of items, each of which contains a relatively small quantity of HEU, to collectively exceed the minimum Category III level.

Using the near-real-time DYMCAS data base with item locations and status, all discrete items at the plant can be identified and located in a timely manner.

## 7.3 Material Balance Areas Used for Material Flow Control

As discussed in earlier sections of this plan, a system of specifically defined geographical material balance areas is used to maintain control of movements of nuclear materials from one facility/area to another for storage or processing. Materials moved between material balance areas move on the basis of measured values in all cases where such is feasible. DYMCAS features are used to a major extent to control movements of nuclear materials between MBAs. Inter-MBA container movements (low and high enriched) are pre-authorized on DYMCAS by Order Planners or NMC&A personnel. Personnel in the shipping and receiving MBAs who have been given the needed DYMCAS menu capabilities exercise the DYMCAS shipper's and receiver's packages, establishing a retrievable track record of the person and time involved in relinquishing and taking on responsibility for the materials being transferred.

## 7.4 Detection and Assessment

### 7.4.1 Daily Administrative Checks

Daily administrative checks are no longer required at the site, since there are no Category I MBAs.

### 7.4.2 Tamper-Indicating Devices

Tamper-indicating devices are used at PORTS, following a graded concept, to detect violations of container integrity. Procedures exist which define the methods used to control the procurement, storage, application, removal, destruction, and documentation of TID's. These procedures identify the position of TID Administrator, within NMC&A. This individual is responsible for overall program coordination, for identification of authorized TID use and application/removal/destruction techniques, and for overall TID control and accountability. The procedures also identify the positions of TID/seal custodians and TID/seal appliers/removers, along with their various responsibilities. The procedures further identify the methods of documenting TID usage and removal, providing information on the form to be used in documenting such activities and its disposition.

Additional sections provide specific information on the plant's TID usage policies for nuclear materials containers. This usage policy follows the graded concept and is intended to provide the highest level of protection and integrity control for highly enriched materials and for other containers which are in locations where there is potential access to highly enriched materials.

A formal training program exists to train all TID Custodians and TID Appliers/Removers in their duties and responsibilities.

# 8.0 SNM LOSS DETECTION ELEMENTS AND EMERGENCY PLANS

This section describes the various loss detection elements which are used by the plant's nuclear materials control and accountability system to detect the possible theft or diversion of special nuclear materials. It also describes the methods and procedures used to respond to incidents and emergency situations which involve the loss or potential loss of control over SNM.

## 8.1 Key Loss Detection Elements

### 8.1.1 Inventory Differences

There are no longer any facilities within the DOE areas at PORTS that routinely perform processing activities that create inventory differences involving nuclear materials. Processing activities for disposition include such things as sampling, blending, material transfers, chemical treatments, re-measurements, sorting, batching etc. These disposition activities are performed by correcting previous values after re-measurements and using arithmetic sums for batching and sorting so as not to create inventory differences. Consequently, any potential inventory differences in DOE MBAs typically involve a loss or gain of discrete items.

### 8.1.2 Container Inventories

Container inventories are taken in each MBA according to the schedule provided in Appendix E-2. These inventories are reconciled against DYMCAS book listings by NMC&A personnel. The priority given to the reconciliation process follows the graded concept. All discrepancies are identified and resolved, and any unresolved discrepancies for nuclear material items are reported and investigated according to the guidelines presented in section 5.7 and section 8.2.

### 8.1.3 TID Violations

Indications of potential tampering with nuclear material containers, rooms, repositories, etc., based on TID inspections are potential material loss indicators. Based on the specific situation, appropriate actions are taken to assess the potential problem and confirm that material loss has not occurred. These actions can include container measurements, special item inventories, and any responses by Protective Force personnel that are required.

### 8.1.4 Confirmatory Measurements

Confirmatory measurements are sometimes performed on containers as part of the receipt measurement process (based on direction from the DOE-ORO MC&A/IS Branch Chief), and as part of a statistical sampling program for materials in selected MBAs. These measurements are performed using scales and/or NDA instrumentation. Any failures of such routine confirmatory measurements are taken as potential material loss indicators and are investigated and resolved to confirm that no material loss has occurred. If the investigation cannot be resolved, the situation is reported to the Manager, NMC&A, who is responsible for assessing the situation and reporting it under the guidelines given in section 8.2.

### 8.1.5 S/R Differences

There are no routine receipts of category I, II, or III quantities of SNM into PORTS. Receipts of category IV items do occur as a result of special DOE programs or requests to store material at the site. PORTS has been designated by DOE as an official "Uranium Management Center" for the receipt and storage of miscellaneous depleted, normal, and low enriched uranium materials. Significant quantities of these materials have been received from other DOE facilities, various universities, and similar small sites across the country.

Any receipts of nuclear materials into DOE MBAs are checked against shipper's documents for accuracy. TIDs are verified, if applicable. Measurement requirements for receipt of Category III or IV materials are specified by the DOE-ORO MC&A/IS Branch Chief. In many instances, materials are accepted without performing confirmatory measurements, based on verification of the material by DOE observers at the shipping facility, or relying on inventory controls at other DOE-regulated facilities.

If measurements are performed, they generally consist of gross weights of SNM items and/or NDA measurements. These confirmatory measurement values are compared to shipper's gross weights and/or $^{235}U$ quantities to confirm that values are within expected uncertainty limits. If weight differences exceed established limits, Order Planners or NMC&A personnel contact the shipper to resolve the discrepancy. Such differences are typically resolved by the shipper accepting the receiver's values, or by return of the involved item to the shipper for re-measurement.

For those shippers who apply TID's to items delivered to PORTS, TID integrity is confirmed upon receipt. If this check results in indication of possible tampering, the item is quarantined and the situation investigated and resolved. For large $UF_6$ cylinders, these situations have potential safeguards implications as well as potential safety implications, since introduction of foreign material into $UF_6$ cylinders (which are at a vacuum during shipment) could result in serious safety hazards during processing.

All $UF_6$ cylinders shipped from PORTS have TID's applied prior to shipment. TID serial numbers are identified on shipping papers.

Following these procedures for SNM shipments and receipts, the infrequent S/R differences which

do occur are resolved in a standardized manner. Thus, S/R differences do not constitute a major material loss element for PORTS. However, if S/R differences occur which cannot be readily resolved through these standard techniques or an item is found missing upon receipt, the situation is reported to operations office personnel as identified in section 8.2.

### 8.1.6 Physical Security Alarms

Most physical security alarms associated with protection of SNM materials were de-activated when Category I and II quantities of materials were eliminated. Any remaining alarms (including broken or violated TIDs) are investigated by Security as necessary. Any conditions which cannot be readily resolved and which provide indication of potential loss of control of SNM are reported to the Manager, NMC&A, or designated alternate. Appropriate decisions are made and actions taken as discussed in section 8.2.

## 8.2 Incident Investigation and Reporting

Investigation and reporting of security incidents involving nuclear materials are performed consistent with procedures and guidelines in the following documents:

DOE M 470.4-6, Change 1, "Nuclear Material Control and Accountability," dated August 14, 2006

DOE M 470.4-1 Change 1, Section N, "Reporting Incidents of Security Concern," dated March 7, 2006.

Appendix H provides a summary of reportable incidents, including the reportable category level for each type. Per DOE M 470.4-1, incidents are categorized using a "Impact Measurement Index" (IMI). The highest level of potential incidents at PORTS falls into the category IMI-3. Such incidents would involve a Category III quantity of SNM.

DOE (both ORO and TPMC, the cognizant security office at PORTS) will be notified if any of the incidents listed in Appendix H occurs. Incidents rated as IMI-3 must be reported to DOE within 8 hours of categorization. Notification will be made following guidance provided in DOE M 470.4-1. Results of investigations will be documented in a written report that will be submitted to DOE consistent with the above directive. The report will describe specifics of the incident, including when, where, and what happened. The Manager, NMC&A, will also inform personnel on the DOE-ORO MC&A/IS Team of any substantial new information that becomes available concerning the incident.

The reports will include all of the pertinent information related to the incident, especially information describing the materials involved or potentially involved, actions taken to resolve the incident, reasons why malevolent action is suspected or has been satisfactorily ruled out, and any further investigative actions which are planned or still in progress.

## 8.3 Emergency Response Measures

Many different types of situations or incidents are possible which require some degree of emergency response activity by the plant's Protective Forces and/or NMC&A. Some such situations can be more commonly expected and are of a generally benign nature (emergency evacuation of facilities, etc.) and some could involve an overt malevolent action by a possible adversary. No attempt will be made here to identify all possible emergency situations or possible combinations of response activities, but some generic response plans and activities will be described.

### 8.3.1 Response Action Determination

The proper response to any emergency situation which involves the apparent or potential loss of control of SNM will be decided collectively by the Manager, NMC&A; the Manager, Security; and the Manager responsible for the involved facility or operation, or their designated alternates. Response decisions shall be made quickly and in keeping with the nature of the situation, and if uncertainties exist as to the proper level of response, the conservative pathway shall be taken to assure that the situation is not responded to in an inadequate manner.

The response actions determined by this decision-making team will be promptly carried out communicated to each involved party. Notification of Oak Ridge Office personnel shall consist, at minimum, of compliance with those requirements identified in section 8.2.

### 8.3.2 Special Inventories

NMC&A together with MBA Management Team personnel will maintain the capability to promptly conduct and reconcile special nuclear material container inventories in each plant facility. Special inventories may be requested to resolve any material control or accounting discrepancy. These could result from routine inventory discrepancies, breach of facility containment, unplanned evacuations, or other alarm situations or unusual events. It is recognized that the best means of being able to promptly respond to situations requiring special inventories is to maintain an accurate near-real-time container database on the DYMCAS system. Also, it is recognized that close control and tracking of nuclear materials containers in small individual areas or storage locations (cages, repositories, etc.) will permit more timely and more efficient response to situations which may involve such individual locations. Also in certain situations, it may be determined appropriate to perform and reconcile inventories on a graded basis so that assurance for more attractive materials can be more quickly obtained.

Support will be obtained from additional personnel needed to support the activities, as necessary to perform and reconcile special inventories in a timely manner. Based on availability of personnel, the following team members may be named by the Manager, NMC&A, to give proper structure and defined responsibilities to the inventory activities:

Special Inventory Coordinator - This will be the Manager, NMC&A, or designated alternate, who will be responsible for overall coordination of the special inventory activities and for making any required decisions to respond to the situation at hand. The Special Inventory Coordinator will remain directly accessible to a telephone in the NMC&A office area and will identify his location and telephone number to all key participants. The Special Inventory Coordinator will keep plant management appraised as to the status of the inventory activities.

NMC&A Field Coordinator - This person will be named by the Special Inventory Coordinator and may be dispatched to the facility involved in the inventory activities, where he/she will support field personnel. The NMC&A Field Coordinator will be the chief source of information to the Special Inventory Coordinator as to the status of field activities and will accept instructions and commands from the Special Inventory Coordinator.

Operations Field Coordinator - A person may also be named by the Special Inventory Coordinator or by the affected MBA Administrator to coordinate operations activities in support of the special inventory. This coordinator usually will be either the MBA Representative (or alternate) of the involved facility or another available and knowledgeable person representing the MBA. The coordinator provides direct instructions to personnel performing the inventory and can coordinate any related work (moving containers to obtain confirmatory measurements, reapplication of TID's, etc.).

Reconciliation Coordinator - This person will be a member of NMC&A, named by the Special Inventory Coordinator. This person will remain in the NMC&A office area (where the reconciliation work will take place) and will assure that a current DYMCAS print-out of the involved area is obtained while the physical inventory work is in progress. The Reconciliation Coordinator will lead the effort to reconcile physical inventory listings with data base listings and will interface with the NMC&A Field Coordinator and Operations Field Coordinator to resolve all discrepancies. The Reconciliation Coordinator will keep the Special Inventory Coordinator appraised as to the status of the reconciliation effort and will immediately identify to them any items that are found to be missing or evidence that a malevolent action exists.

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## 9.0 INTERNAL AUDIT PROGRAM

An internal audit program has been established for PORTS NMC&A activities. It is comprised of periodic independent assessments as well as routine walkthrough surveillances by NMC&A personnel. Elements of the program are described below:

### 9.1 Audit Requirements

The NMC&A Audit Program at PORTS is driven by requirements from several sources due to the complex of regulatory agencies with facility oversight responsibilities. Based on these requirements the facility has an internal control system for its NMC&A program which includes a diversity of measures that combine together to assure that an adequate level of nuclear materials safeguards is maintained at a reasonable and cost effective level.

The source and description of audit program requirements are as follows:

#### 9.1.1 DOE Manual 470.4-6

Significant audit requirements are contained in DOE M 470.4-6 "Nuclear Material Control and Accountability." These include:

> A.1.l. - "Personnel performing MC&A functions must be trained and qualified to perform their duties and responsibilities..... A site specific training program must be established, implemented and maintained. Personnel must be knowledgeable of requirements and procedures related to their functions".
>
> A.6.a - "The site/facility operator must establish a program to periodically review and assess the integrity and quality of its MC&A program and practices....The frequency and content of these assessments must be on a graded basis approved by the DOE cognizant security authority."

#### 9.1.2 DOE Oak Ridge Office Order ORO O 470, Chapter IX, Change 3

Additional detailed audit requirements are specified in Attachment 2 of ORO O 470, Chapter IX, Change 3, "Control and Accountability of Nuclear Materials":

> 6.a. - "The facility program for periodic assessments and reviews shall contain the following procedures:

(1) An annual plan for the number of assessments and the topics to be covered shall be prepared by the contractor and submitted to the MC&A/IS Team by August 15 for the next fiscal year. The contractor shall advise the MC&A/IS Team of any changes to the annual assessment plan which materially alter the scope and/or schedule of the plan as such changes occur. Other changes may be reflected in periodic status reports issued to the MC&A Team. The annual assessment plan shall be approved by the MC&A/IS Team.

(2) The contractor shall submit periodic status reports to the MC&A Team. Status reports shall indicate progress of the facility's assessment program (actual versus plan) and reflect any changes in the annual assessment plan scope/schedule since the previous status report. The MC&A/IS Team will review and concur in the status report frequency and content.

(3) A copy of each report on an assessment or review during which a discrepancy was cited that remains uncorrected at the time the report is issued shall be provided to the NMC&A/IS Team. Submittal of all other reports on assessments and reviews to the MC&A/IS Team is not required.

(4) An independent audit of the facility's MC&A function shall be conducted in accordance with the requirements of DOE M 474.1-1B Chapter I, subparagraph 6 (Now contained in DOE M 470.4-6, Section A, Chapter I, subparagraph 6). The audit schedule shall be approved by the MC&A/IS Branch Chief and documented in the facility's MC&A Plan."

### 9.1.3 NRC Regulatory Guide 5.67

The United States Nuclear Regulatory Commission (NRC) Regulatory Guide 5.67 describes implementation of requirements in 10 CFR 74.33 "Material Control and Accounting for Uranium Enrichment Facilities Authorized to Produce Special Nuclear Material of Low Strategic Significance." USEC is required to conduct periodic internal assessments to evaluate compliance with these NRC requirements. These assessments cover some aspects of USEC operations which are also applicable to the DOE program. This is especially true in the case of accountability measurements and measurement control programs.

Specific requirements in NRC Regulatory Guide 5.67 which are applicable to USEC support of DOE operations include:

C.10.2 - "The areas to be reviewed must encompass the entire NMC&A system..." The report should provide findings pertaining to:

1. Organizational effectiveness to manage and execute NMC&A activities.
2. Management responsiveness to indications of possible losses of uranium.
3. Staff training and competency to carry out NMC&A functions.
4. Reliability and accuracy of accountability measurements made on source material and special nuclear material.
5. Effectiveness of the measurement control program in monitoring measurement systems.
6. Accuracy of the material accounting records.
7. Effectiveness of the item control program to track and provide current knowledge of items.
8. Capability to promptly locate items and effectiveness in doing so.

## 9.2 General Program Features

The internal audit program includes assessments performed by an independent organization and surveillances performed by NMC&A Group personnel. To support USEC/NRC requirements, an internal audit of the NMC&A program is conducted at least once every 24 months by auditors from the Nuclear Safety and Quality (NS&Q) organization. As indicated in section 9.1, this audit is also applicable to many aspects of the NMC&A program support provided by USEC to DOE. Spot audits/performance tests are performed routinely by NMC&A personnel in specific DOE MBAs to assess specific features of the program.

### 9.2.1 Development of Internal Audit Plan

The Manager, NMC&A, working with the Manager, NS&Q, is responsible for development of a specific audit schedule each year. The annual schedule is intended to be detailed enough to assure that the overall program is fully maintained, yet sufficiently flexible to permit response to special audit needs, which may arise within the annual period, with available funds and resources. The schedule for the next fiscal year will be submitted to the DOE-ORO MC&A/IS Branch Chief by August 15 each year.

### 9.2.2 Types of Audits

The NMC&A internal audit program consists of three types of audits:

1) Audits of specific aspects of the NMC&A program are performed biennially by auditors from the NS&Q organization. Elements reviewed are those listed in the NRC Regulatory Guide.

   The lead auditor may be supported by other persons, including local subject matter experts, Paducah plant personnel, or outside contractor personnel with NMC&A experience.

2) NMC&A Group personnel conduct spot audit/performance tests at specified frequencies in each MBA. These surveillances review the effectiveness of implementation of NMC&A requirements for item control, procedure usage, TID usage and control, and NMC&A training. A schedule of spot audits/performance tests is created each year and submitted to the DOE-ORO MC&A/IS Branch Chief by August 15.

3) NMC&A will also conduct any required one-time audits of specific facility, process, or operational changes with potentially significant impact on nuclear material safeguards.

### 9.2.3 Audit Standards

For each required audit topic, the regulatory sources detailed in section 9.0 will be used as a general guide. Plant procedures and various group level procedures (including NMC&A procedures) will be used to evaluate compliance. Audit findings will be based on field inspections, observations, interviews, and performance tests to determine the actual level of compliance with requirements stated in the above documents.

## 9.3 Audit Reporting and Followup

### 9.3.1 Internal Audit Reports

A formal audit report is prepared for each audit performed by the NS&Q auditors. Reports will be prepared using required standardized formats and will identify the areas examined, the techniques used in the examination, and the results of the audit. Findings included in the audit will be contrasted against specific regulatory requirements, exceptions or waivers to those requirements, or specific procedural directives and will detail the specific nature of the noncompliance.

Results of spot audits/performance tests are documented to the Manager, NMC&A, with copies provided to affected groups. Deficiencies identified during the audit are addressed by taking appropriate compensatory actions and/or evaluating long-term corrective measures.

One-time audits of specific facilities, processes, or operations performed by NMC&A will be documented in a "readiness review" format. Because such audits are required prior to implementation of the proposed changes, tracking of non-compliances should be unnecessary. Final approval for the proposed or modified changes will be made by NMC&A Management.

### 9.3.2 Report Distribution

Internal audit reports prepared by NS&Q will be distributed to the Manager, NMC&A, other involved plantsite management, and the DOE-ORO MC&A/IS Branch Chief, as requested.

Audit reports and summaries of assessments conducted by NMC&A will be distributed to involved plantsite management. They will be maintained in NMC&A files and made available for review as requested.

### 9.3.3 Audit Followups

Audit findings will be placed on appropriate plantsite compliance tracking systems for management review and followup. Managers of involved areas will be assigned ownership of tracker items and be required to assure that appropriate corrective actions are taken to resolve the findings. The Manager, NMC&A, will assist these managers to assure that corrective actions adequately address noted deficiencies. Followup audits may be initiated to assure that corrective actions are adequate, when successfully implemented.

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# 10.0 NMC&A TRAINING PROGRAM PLAN

## 10.1 Introduction

This portion of the NMC&A Plan outlines the NMC&A training program at PORTS. The training program plan was designed to meet the basic requirements of all DOE Orders dealing with training issues. The PORTS NMC&A training program also attempts to maintain practical, cost effective flexibility in meeting the changing requirements and goals.

NMC&A recognizes that quality training is essential to ensure that nuclear material accountability data are properly received, processed, and reported. Consequently, NMC&A is committed to continual development and maintenance of necessary training programs for plant personnel involved in NMC&A related activities.

## 10.2 Policy

### 10.2.1 General

The NMC&A Training Program attempts to ensure that all personnel performing NMC&A related tasks are:

1. Knowledgeable of NMC&A requirements and procedures pertaining to their duties.

2. Properly skilled and able to perform their NMC&A tasks.

3. Aware of the impact that performance of their duties has on NMC&A.

### 10.2.2 Training Requirements

NMC&A ensures basic training programs are provided for the following USEC and subcontractor personnel:

1. NMC&A accounting personnel.

2. Employees designated as Nuclear Material Representatives to NMMSS, Material Balance Area (MBA) Representatives, or Designated Nuclear Material Custodians.

3. Employees designated as Tamper-Indicating Device (TID) Custodians and Appliers.

4. Measurement personnel (including any site employee involved in nuclear material accountability measurements and/or calibrations associated with bulk measurements, sampling, and analysis of nuclear material).

5. Plant management (MBA Administrators and others with specific NMC&A duties).

Training programs for the above groups are discussed in greater detail in section 10.4

### 10.2.3 Training Requirements Analysis

Training requirements analysis is an ongoing process performed primarily by the NMC&A Training Coordinator.

Training requirements analysis for NMC&A at PORTS is based on job function. Function analysis is appropriate because NMC&A functions (tasks) are performed by a wide variety of job classifications. Training programs are designed to provide knowledge, skills, and abilities necessary to perform the function. Job classifications and assignments are reviewed to determine which personnel perform the function. Training is scheduled accordingly. Prior qualification, formal education, and related experience are considered whenever possible to minimize the training effort, but never at a compromise to the overall NMC&A effort.

Training requirements analysis also includes reviews of audit findings where training may be recommended.

### 10.2.4 Training Material Development

NMC&A training materials are developed in accord with site regulatory requirements.

NMC&A lesson plans are designed to be readily adapted into other plantsite training programs. Formal job/task analysis of many classifications, particularly in the areas of operations and maintenance has been conducted. Whenever an NMC&A related task (function) is identified, the NMC&A lesson related to the function is incorporated into training for that classification at an appropriate level.

Applicable DOE requirements for the NMC&A training program are contained in DOE M 470.4-1, Change 1, Part 2, Section J, "Safeguards and Security Training Program." The National Training Center (NTC) provides standardized training courses for the key program elements and makes them available to DOE Elements and contractors for use in their training programs. National Training Center lessons are utilized where practical to enhance the site NMC&A training program.

### 10.2.5 Implementation and Scheduling

Training sessions are scheduled to accommodate the majority of the students' work schedules. The majority of necessary NMC&A training conducted at PORTS is scheduled and delivered by trainers in the various site operating organizations. The NMC&A Training Coordinator is available to assist other trainers upon request. Certain training lessons are delivered solely by the NMC&A Training Coordinator. The need for make-up training sessions is decided on a case-by-case basis in accordance with applicable programs.

### 10.2.6 Examination/Evaluation

Training evaluations are based on demonstration of knowledge, skills, or abilities necessary to perform the NMC&A function. Section 10.4 on "Training Topics" defines completion requirements for each training session.

Training exercises and written tests are designed to not only evaluate the performance of the student, but reflect the effectiveness of training session contents. All training exercises and written tests are reviewed prior to dismissal of the training session. Any attendee failing to achieve an established minimum passing score will receive immediate feedback from the instructor to assure an understanding of NMC&A responsibilities.

### 10.2.7 Training Records/Documentation

Training records and documentation are maintained in accordance with USEC and/or DOE Contractor requirements, as applicable.

### 10.2.8 Training Program Evaluations

An annual review of this training program plan is initiated by the NMC&A Training Coordinator. The plan is reviewed for applicability, accuracy, completeness, and overall effectiveness. Details of this review are submitted to the NMC&A Manager.

The NMC&A Training Coordinator is also responsible for implementation of training made necessary due to revision of NMC&A policy and/or procedures.

Training lessons will be reviewed periodically in compliance with site Training organization requirements.

The NMC&A Training Coordinator continually responds to comments provided on the critique forms, incorporating minor changes to the lessons immediately. Major changes require a full review and approval.

### 10.2.9 Instructor Qualifications

Each NMC&A instructor should attend "Training Instructor Certification" or viable "basic instructor training" in accordance with plantsite procedures, and be granted certification by the site Training organization.

### 10.2.10 Student Qualification

Qualification and refresher training requirements applicable for each training lesson are defined in Section 10.4, Training Topics.

## 10.3 RESPONSIBILITIES

### 10.3.1 NMC&A Training Coordinator

It is the responsibility of the NMC&A Training Coordinator to:

1. Assess plant NMC&A training needs.
2. Assure proper maintenance and administration of this training plan.
3. Aid in the development of NMC&A training lesson plans.
4. Develop lesson plans and performance based training sessions for NMC&A training topics (those with common involvement by various plant groups).
5. Maintain records of training documentation per site requirements.
6. Oversee NMC&A training activities performed by other plant organizations.
7. Coordinate NMC&A training activities with the site Training organization.
8. Coordinate periodic review of NMC&A training lesson plans.
9. Develop and maintain information exchange with DOE and other outside support groups concerned with NMC&A training.
10. Maintain Required Reading records per site requirements.

### 10.3.2 Training Organization

It is the responsibility of the USEC Training organization to:

(NOTE: These are applicable to USEC personnel/courses only.)

1. Maintain records of all NMC&A training attendance.
2. Serve as a source of guidance for NMC&A Training Coordinator in the development and delivery of training.
3. Deliver training for proper qualification of instructors.
4. Review and approve NMC&A related training courses.
5. Ensure NMC&A training lessons are periodically reviewed and updated, as necessary.
6. Process documentation for NMC&A training to Records Management.

### 10.3.3 PORTS/DOE Contractor Personnel

It is the responsibility of each employee to attend NMC&A training courses when scheduled to do so. If a scheduled employee is unable to attend at the time designated, they should advise their organization's Training Coordinator to reschedule.

### 10.3.4 NMC&A Personnel

It is the responsibility of all NMC&A personnel to:

1. Aid the NMC&A Training Coordinator in the development of training materials, presentation of training sessions, and assessment of NMC&A training needs.
2. Attend training sessions as scheduled.
3. Review materials routed as Required Reading.

## 10.4 TRAINING TOPICS

### 10.4.1 NMC&A Awareness

1. Management Awareness of NMC&A

   MBA Administrators, upon initial assignment, complete form A-4498 to acknowledge their responsibilities as they are defined in this plan. MBA Administrators and various other levels of plant management with NMC&A related activities occurring under their oversight, are also provided periodic briefings on NMC&A requirements and responsibilities. The briefings may consist of informal meetings to discuss NMC&A related issues, or mailings of information pertinent to NMC&A. No formal lesson is utilized. There is no minimum performance requirement.

   MBA Administrator acknowledgement forms are submitted to the site Training organization for inclusion in personnel training files.

2. Employee Awareness of NMC&A

   All employees receive Security Awareness training. This training may include basic safeguards information regarding the control and accounting for nuclear materials. Cleared individuals for DOE Contractors receive a comprehensive security briefing, including requirements for protection of SNM. Documentation of this training is maintained per applicable site/organization requirements.

### 10.4.2 Material Balance Area Operations

Nuclear Material Custodian Training - NMC010202

This class is presented biennially to all MBA Representatives, Alternates, and specifically designated Custodians. The class is conducted by the NMC&A Training Coordinator. A written test is presented with a minimum passing score defined in the current lesson plan.

### 10.4.3 Tamper Indicating Devices (TID)

1. TID Custodian Training - NMC010101

   This course is presented initially to all persons designated by supervision as TID Custodian. A written test is given at the completion of the training. Attendees must achieve a minimum passing score as defined in the current lesson plan.

2. TID Applier Training - NMC010102

   This course is presented to all persons designated as TID Appliers.
   A written test is given at the completion of the training, along with a hands-on performance evaluation of TID sealing techniques. Students must achieve a minimum passing score as defined in the current lesson plan and demonstrate their ability to properly apply and remove TID's.

   Initial training is conducted by the NMC&A Training Coordinator. Refresher training is currently required every two years. Refresher training generally consists of an evaluation of TID knowledge and on-the-job performance, by a current TID Custodian. Documentation of such evaluations is submitted to Plant Training.

### 10.4.4 DYMCAS Training

All persons designated as DYMCAS users must be knowledgeable and qualified to perform their NMC&A duties related to DYMCAS. Training at various levels of expertise is offered by NMC&A and other organizational Training Programs.

Training on DYMCAS is generally required on an initial basis with no defined periodic follow-up. NMC&A evaluated the level of experience of individuals whose DYMCAS responsibilities predated this training program. The evaluation determined that no formal DYMCAS training would be necessary for this group.

Review of DYMCAS operations are made on a continual basis by the NMC&A organization. Should deficiencies be detected, additional training to rectify them may be recommended. Should a person's PPN expire or be unused for an extended period, retraining may also be recommended. Should an individual with DYMCAS responsibilities move to another position with significantly different responsibilities, supplemental or refresher training may be recommended.

### 10.4.4.1 DYMCAS Training Lessons

1. DYMCAS Basics - NMC020101

   This course is intended for all persons acquiring DYMCAS operating capability. The course covers system administration, operating hierarchy, and security plans and restrictions.

   The DYMCAS Administrator provides the NMC&A Training Coordinator with notification on persons designated as DYMCAS users. The Training Coordinator notifies the DYMCAS Administrator when training is complete. No menu assignments are made until training is completed.

   The instructor utilizes a written exercise in order to evaluate the student's understanding. Requirements for minimum passing scores are defined in the current lesson plan.

2. DYMCAS Transactions and Authorizations - NMC020301

   This course extends from the "DYMCAS Basics" to deliver detail on the movement and transfer of nuclear materials. Handout materials act as a ready reference to the various types of documented transactions occurring within DYMCAS.

   The course is not mandatory, and is recommended only for DYMCAS users desiring a high level of expertise on the DYMCAS system.

   A written test is presented and reviewed in a workshop fashion to evaluate attendee performance. Minimum passing scores are defined in the current lesson plan.

### 10.4.5 Measurements Training

Training is developed and implemented by the various organizational training programs for the key nuclear materials measurement functions performed by employees. Measurements training relates to four basic categories:

1. Destructive Analysis
2. Non-Destructive Analysis
3. Mass Measurement
4. Sampling Methods

The NMC&A Training Coordinator is available to assist other Organizational Training Coordinators in the development of measurements training. The NMC&A Measurement Control Coordinator serves as a subject matter expert for development of measurement training.

All measurements related training is entered into the Training database maintained by the site Training organization. Minimum completion requirements should be defined in the current lesson plans.

All measurement-related training records for approved contractors must be obtained by LPP and provided to the MCC for review.

### 10.4.6 Accounting

Upon initial assignment, the DOE Nuclear Materials Representative receives informal training from the NMC&A Manager or designee. This training provides details on completion of a DOE/NRC 741 Form and the responsibilities the Nuclear Materials Representative has for acknowledgement of authorized shipments and receipts of nuclear materials as required by DOE Orders.

Documentation of this training and the specific subjects covered is submitted to the site Training organization for inclusion in personnel training files.

On-the-job training for the accounting staff of NMC&A is also provided by the NMC&A Manager on a level appropriate to education and experience. Appropriate NMC&A accounting procedures are reviewed during this training. The Manager paces the training to the employee's performance. The Manager utilizes informal written tests for evaluation of the employee's performance. The NMC&A Training Coordinator maintains copies of the completed tests in order to document on-the-job training. Follow-up training on procedures is accomplished through the use of required reading logs. (See 10.4.7) Within budget constraints, NMC&A Accounting personnel are sent for additional training on the NMMSS as provided by NTC or Nuclear Assurance Corporation.

### 10.4.7 Required Reading Logs

The NMC&A Manager reviews all NMC&A procedures prior to issue in order to determine training needs. For those procedures that directly affect the functions performed by NMC&A personnel appropriate training requirements are noted and implemented by the NMC&A Training Coordinator. Training lessons are modified as required.

Most procedure revisions are noted as "required reading" for specific NMC&A personnel. If so noted, the NMC&A Training Coordinator distributes the procedure for completion of this "required reading". A listing of personnel directly affected by the procedure is attached. Personnel acknowledge their review and understanding of the procedure with signature and date.

The NMC&A Training Coordinator maintains the required reading logs per site records management requirements.

### 10.4.8 Nuclear Material Representative Training

One or more individuals are authorized by DOE and/or contractor organizations to be official Nuclear Material Representatives for DOE Reporting Identification Symbols at the site. These individuals are responsible for signing official documentation associated with nuclear material transactions and inventory submittal to NMMSS.

NMC&A personnel prepare DOE/NRC Forms 741, Reports M-742, and other documents for nuclear material transactions. These personnel have in-depth knowledge of NMMSS accounting practices and requirements. Some NMC&A individuals obtain NMMSS-specific training by attending courses at the NTC or elsewhere.

DOE contractor personnel who are designated as NMMSS Nuclear Material Representatives are provided informal training by the NMC&A Manager or designee. The training consists of an overview of the NMMSS structure, requirements associated with transfer of nuclear materials, review of associated procedures for reporting, details of DOE/NRC Form 741 data elements, and other job-specific information necessary to perform the tasks required of a Nuclear Material Representative. No formal lesson plans are used for this training. If requested, the Nuclear Material Representative also may attend specific NMMSS courses presented by the NTC or Nuclear Assurance Corporation to obtain supplemental understanding of NMMSS activities.

## 11.0 LEGACY HEU ACTIVITIES

The Portsmouth Gaseous Diffusion Plant was constructed in the mid-1950's for the purpose of enriching uranium to weapons grade levels. Operational objectives later shifted to production of Very Highly Enriched $UF_6$ (≈ 97% $^{235}U$) to be used in the manufacture of fuel for naval nuclear reactors. Production of low enriched uranium for commercial nuclear reactors began in the 1960's, supplementing the HEU production activities.

This mode of operation continued until a decision was made in 1991 to terminate production of HEU material. The diffusion cascade was reconfigured to produce low enriched $UF_6$ only. A large number of process cells in X-326 were no longer needed to support LEU production and were systematically shut down.

The USEC assumed responsibilities for LEU production on July 1, 1993. The NRC certified USEC to operate as a LEU production facility, limiting production to material enriched to less than 10 weight percent $^{235}U$. NRC began regulating USEC operations on March 3, 1997.

PORTS still has a significant presence of uranium enriched above 10 weight percent $^{235}U$, as a result of legacy HEU production activities. This includes uranium in nuclear material containers, discrete items of contaminated process equipment, scrap and waste materials, and as holdup on internal surfaces of installed cascade equipment. This section describes the controls, accounting, and regulatory practices associated with this material.

### 11.1 Regulatory Oversight

Based on agreement reached between DOE and NRC in 1993[1], DOE retains responsibility for HEU materials at PORTS:

> " During the entire period that uranium enriched to 20 percent or more $^{235}U$ is located at the Portsmouth facility, DOE will retain title to and possess such uranium and will be solely responsible for providing for, establishing and maintaining nuclear safety, safeguards and security controls applicable to such uranium."

Since the entire cascade process is leased to USEC, the HEU within installed equipment resides in leased space. Per the USEC NRC Certificate, inaccessible material within installed process equipment does not count against USEC's possession limits. However, per agreement, once the equipment is breached, any such material must be transported out of leased space to a DOE area.

(1) - *Joint Statement of Understanding Between NRC and DOE on Implementing Energy Policy Act Provisions on Regulation of Gaseous Diffusion Uranium Enrichment Plants*, December 20, 1993.

DOE has agreed to maintain accountability for all HEU materials at PORTS, with the exception of a few small standards maintained by USEC within leased and NRC-certified space. Additionally, DOE has agreed with USEC to accept materials containing uranium enriched between 10 and 19.99 weight percent $^{235}U$ to allow USEC to maintain compliance with NRC limits, as long as USEC bears the cost to DOE for maintaining such materials.

NRC continues to regulate activities within leased and certified areas. DOE regulates activities outside these areas. Procedures exist which describe steps necessary to transfer materials between USEC and DOE space, and the associated controls necessary to maintain documentation and accountability of uranium being transferred.

## 11.2 Uranium Holdup in the Cascade

As a natural part of gaseous diffusion operations, some of the $UF_6$ process gas reacts with internal metallic surfaces to form solid uranium compounds, such as $UF_4$ and $UF_5$. Also, any moisture that enters the process, via atmospheric air leaks or otherwise, reacts immediately with gaseous $UF_6$ to form solid $UO_2F_2$ and HF gas. These solid uranium compounds are present on internal surfaces throughout the cascade.

Between 1992 and 1996, as part of the effort to suspend HEU production, most of the process cells in X-326 were given a series of chemical treatments. These treatments re-fluorinated the solid uranium compounds to gaseous $UF_6$, which was then bled back to the operating cascade. These treatments reduced the size of the remaining deposits of material to less than a Nuclear Criticality Safety always-safe mass. However, each cell continues to contain some amount of solid uranium from previous operations.

Upon completion of the treatments, Non-Destructive Assay measurements were performed to determine the amount of uranium and $^{235}U$ remaining in each cell. Measurements were obtained at 36 different locations within the cell, over each compressor, cooler and converter. The $^{235}U$ enrichments of the deposits were based on historical operating gradients.

Following completion of the cell treatments, the majority of cells in X-326 were permanently shut down. The only cells returned to USEC for continued use in the LEU cascade are as follows:

| Unit | Cells |
|---|---|
| X-27-1 | 1, 3, 5, 7, 11, 15, 19, 18, 16, 14, 12, 10, 4, 2 |
| X-27-2 | 1, 7, 11, 15, 18, 12, 10, 8 |
| X-25-7 | All |

Solid uranium holdup in the operating cells is the responsibility of USEC. It is considered to be "Retained Inventory" similar to that in the lower part of the cascade, and is not entered on accounting records.

The amount of uranium holdup enriched to greater than or equal to 10 weight percent $^{235}U$ in installed, shutdown equipment has been entered into official accounting records in NMMSS Reporting Identification Symbol GBA. This symbol describes material possessed by DOE at PORTS. The holdup is categorized as Material Type 89 - "Material in Cascades". It has a separate DOE Project Number of E-CD-1004-500, used exclusively for holdup. Within DYMCAS, two entries are made; one for material enriched between 10-19.99 percent and one for material enriched to ≥20 percent.

If equipment is removed from the shutdown cells, it must be measured and transferred to DOE space. This activity is described in the next section.

## 11.3 DOE Material Storage Areas

When USEC was created in 1993, various facilities at PORTS were leased from DOE for use in the LEU production process. These included all facilities and equipment in the three primary process buildings (X-333, X-330 and X-326), with the exception of the X-326L Hazardous Waste Storage Area.

While USEC operates the LEU production process, DOE remains responsible for some uranium-bearing materials which are present as a result of legacy HEU operations. In order to achieve compliance with NRC regulations, some of the leased space was turned back over to DOE for use in storing these legacy materials. These spaces are identified as "DOE Material Storage Areas (DMSAs)". They are non-leased areas which continue to be regulated by DOE.

Per plant procedures, the USEC Waste Management group, in conjunction with DOE and DOE Contractors, identifies and documents locations of DMSAs. Each DMSA has signs posted at the boundaries, identifying the DMSA and associated access controls.

Materials present in DMSAs include converters, compressors, valves, piping, pigtails, and many other types of contaminated components. Some items are consolidated into large boxes (B-25 boxes) which may have the lid welded shut. Other items are stored on the operating or cell floors of the process buildings. One DMSA, DMSA-12, located in X-326, is enclosed by chain link fence and locked gates. Materials containing HEU are stored in this area.

Inventories of items in DMSAs are the responsibility of the DOE and maintained by DOE contractors. The total quantity of material in the DMSAs is maintained on DYMCAS by NMC&A. A separate account and/or material code is maintained on DYMCAS to track the amount of material in the DMSAs. Transfers into and out of a DMSA are reported to NMC&A and documented (if appropriate) on a DOE/NRC Form 741 as described in the following section.

## 11.4 Transfer Controls for DOE Legacy Materials

Transfer of materials into DMSAs is governed by plantsite procedures. Specific pre-approval must be obtained from DOE before a transfer is performed. The quantity of nuclear material is to be established, either by NDA measurements or process knowledge.

If equipment/components containing uranium enriched to 10 percent or greater are removed from a shutdown cell in the X-326 building, specific steps are taken to transfer the items to a DMSA. While equipment is installed in the cascade, NDA measurements are obtained on major components to establish the estimated quantity of material in the component to be removed. NDA data and/or process knowledge are used to estimate the $^{235}U$ enrichment in major components, and the quantity and enrichment of material in other equipment.

Upon removal from the cascade, the component is transported immediately (typically within one shift, but in no case to exceed seven calendar days) to a DMSA. The component is isolated from excess background radiation and new, improved NDA quantitative measurements are obtained. The revised measurement data are provided to NMC&A to document the removal of uranium from the cascade.

As part of the monthly accounting process, NMC&A creates a DOE/NRC Form 741 documenting transfers of Material Type 89 - "Material in Cascades" to Material Type 20 - "Enriched Uranium". The accounting journal includes an itemized list of components transferred during the period. The uranium in the transferred components is placed in NMMSS Composition Code C-12 - "Miscellaneous Uranium Fluorides". This transaction reduces the NMMSS value of uranium holdup in the cascade and adds it to the DMSA inventory.

For transfer of items from USEC-operated equipment into a DMSA, the accounting process is slightly different. Because this transfer is across RIS symbols, a DOE/NRC Form 741 is issued within one working day of the transfer. The transfer is based on measured data, as described above, or on process knowledge. If necessary, revised NDA measurements are obtained once the component has been isolated in the DMSA. NMC&A issues a corrected DOE/NRC Form 741 if measurement data are significantly different from the original values.

## 11.5 Monitoring and Surveillance

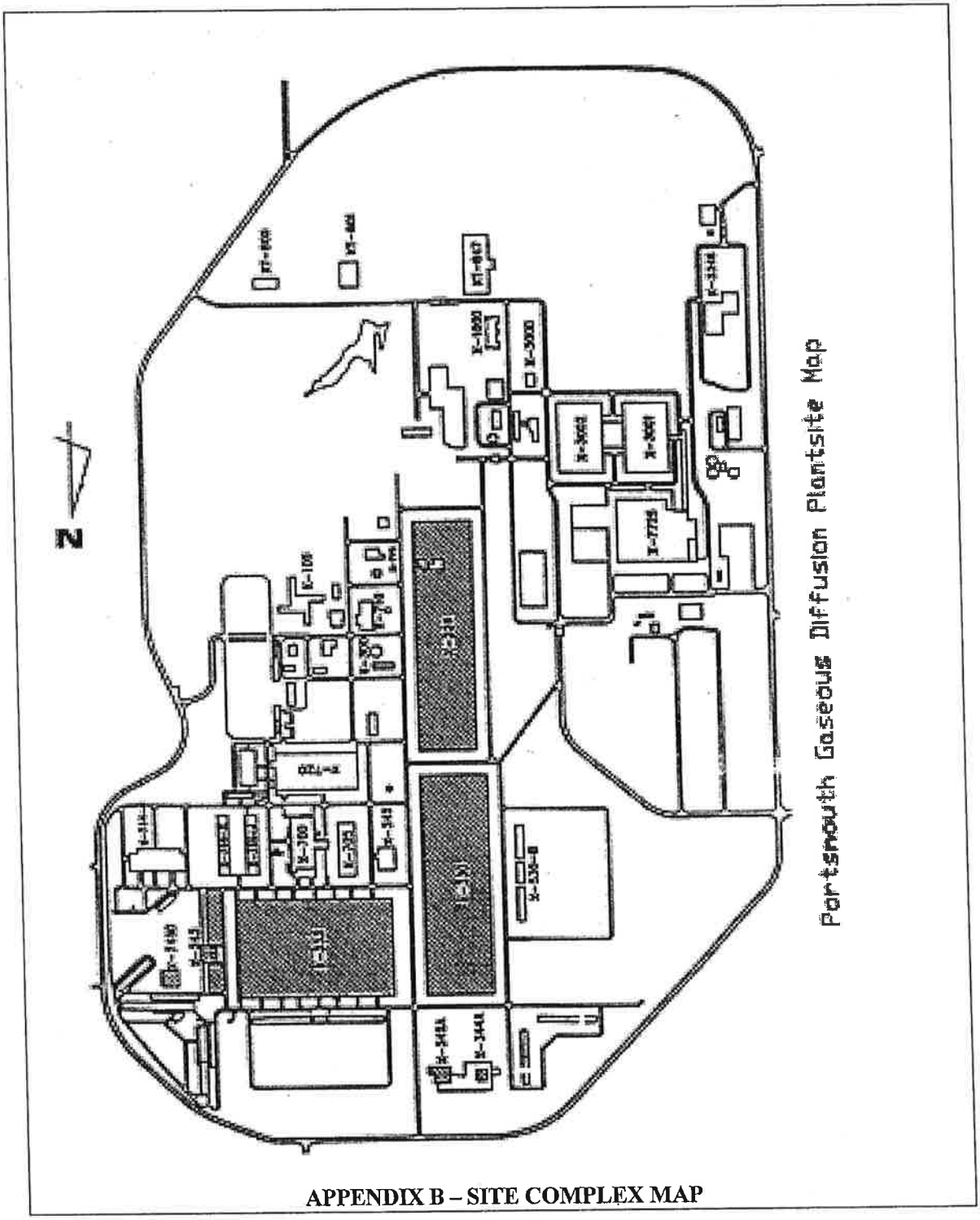
The quantity of nuclear materials in DMSAs is maintained at Category III or lower levels. Specific monitoring and surveillance actions have been implemented for DMSA-12 to ensure safeguards appropriate for Category III quantities of material are provided. Details of these actions are contained in specific security plans at the site.

DMSA-12 is maintained as an official DOE MBA, utilizing controls appropriate for Category III quantities of materials. Details associated with operation of the MBA are contained in plant procedures.

| | |
|---|---|
| XP2-SS-NM1030 | Nuclear Materials Accounting System |
| XP2-SS-NM1031 | Sampling and Measurements |
| XP2-SS-NM1032 | Measurement Control Program |
| XP2-SS-NM1040 | Independent Assessment and Review of the NMC&A Program |
| XP2-SS-NM1042 | Contingency Plan for Movement of Containers Without DYMCAS |
| XP2-SS-NM1043 | Dynamic Materials Control and Accountability System Operations |
| XP2-SS-NM1044 | Accounting for Transfers of Nuclear Materials Between DOE and NRC Regulated Areas |
| XP2-SS-NM1046 | Verifying Container Volume and Measuring Container Volume |
| XP2-SS-NM1047 | Control and Usage of Tamper Indicating Devices |
| XP2-SS-NM1048 | Administration of Material Balance Areas |
| XP2-SS-NM1049 | Emergency Inventory and Reconciliation |
| XP4-SS-NM1101 | Month End Closure of Accounting Records |
| XP4-SS-NM1102 | Reconciliation with Nuclear Materials Management and Safeguards System |
| XP4-SS-NM1103 | Journal Entries |
| XP4-SS-NM1105 | Non-$UF_6$ Flows |
| XP4-SS-NM1107 | Accounting for Material Receipts |
| XP4-SS-NM1108 | Accounting for Material Shipments |

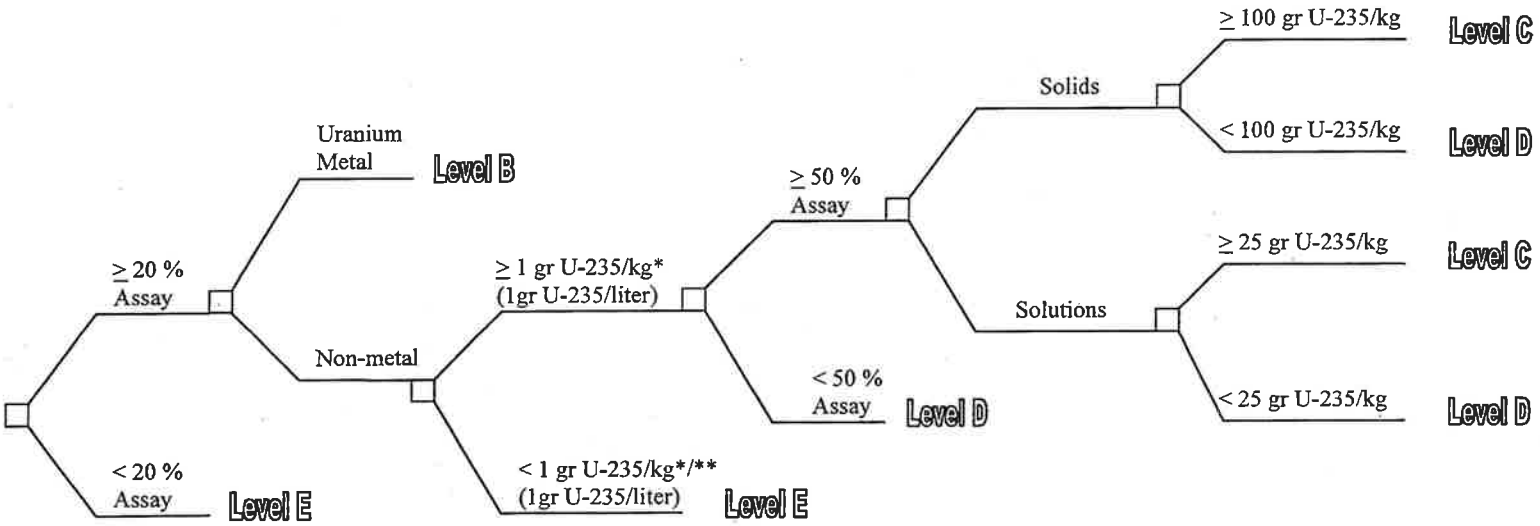
**APPENDIX A - NMC&A PROCEDURES**

| | |
|---|---|
| XP4-SS-NM1116 | Reporting DOE/NRC Form M-742 Material Balance Report Data and DOE/NRC Form 742C Inventory Data |
| XP4-SS-NM1118 | Determination of Radioactive Source Decay |
| XP4-SS-NM1119 | Preparation of DOE/NRC Form 741 for MMSS Reporting |
| XP4-SS-NM1301 | Monitoring Field Accountability Scale Performance |
| XP4-SS-NM1302 | Monitoring Certification of Mass Standards |
| XP4-SS-NM1303 | Monitoring Laboratory and Non-Destructive Analysis Accountability Systems Performance |
| XP4-SS-NM1304 | Maintaining Measurement Control Program Information and Tracking Monitoring Requirements |
| XP4-SS-NM1402 | Tamper Indicating Device Procurement, Security, and Record Keeping |
| XP4-SS-NM1403 | DOE Confirmatory Program |
| XP4-SS-NM1508 | Reconciliation of Static Item Inventory |
| XP4-SS-NM1901 | Conducting Spot Audits/Performance Tests |




**APPENDIX B – SITE COMPLEX MAP**

Analysis of Nuclear Materials for Determination of Attractiveness Level




*If a documented discard limit for the specific material type exists, it may be substituted for the 1 gr U-235/kg criterion.

** Refer to DOE M 470.4-6, Table I-2 for the maximum concentration of SNM in various lower-grade forms of Attractiveness Level C and D material that can be classified as Attractiveness Level E for purposes of terminating safeguards.

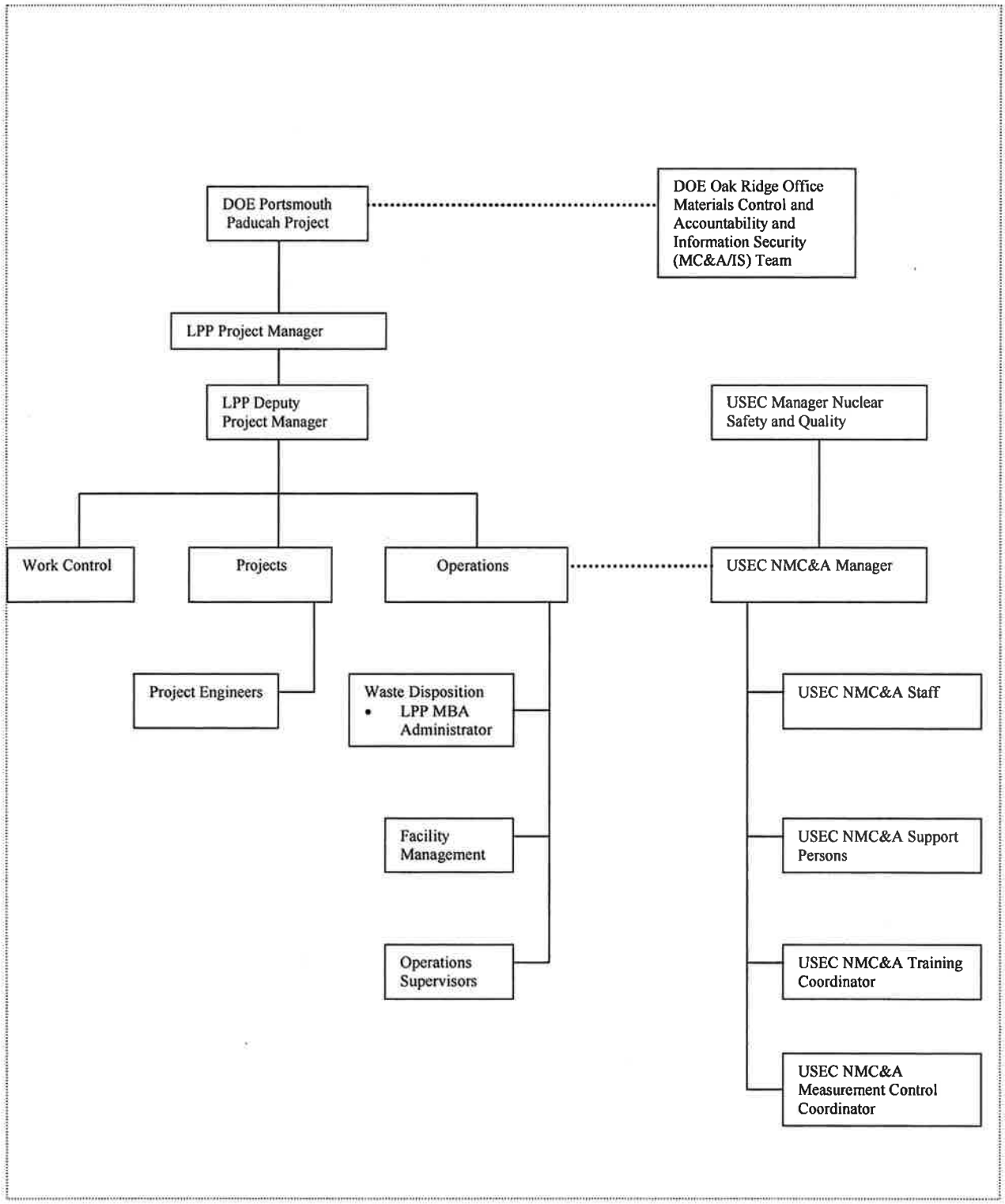
**APPENDIX C-1 – NUCLEAR ATTRACTIVENESS LEVELS**

ANALYSIS OF NUCLEAR MATERIALS FOR DETERMINATION OF CATEGORY QUANTITY

| Attractiveness Level | Contained U-235 Category (quantities in kgs) | | | |
|---|---|---|---|---|
| | I | II | III | IV |
| C High Grade Material | ≥ 20 | < 20 But ≥ 6 | < 6 But ≥ 2 | < 2 |
| D Low Grade Material | | ≥ 50 | < 50 But ≥ 8 | < 8 |
| E All Other Material | | | | ANY QUANTITY |

**APPENDIX C-2 – NUCLEAR MATERIAL CATEGORIES**

# Appendix D
# LPP/NMC&A (USEC) Organization Chart



| MBA NO. | MBA TITLE | FUNCTIONAL FACILITIES | TYPE | SNM CATEGORY |
|---|---|---|---|---|
| 7 | Scrap Storage | X-744G | Storage | IV |
| 10 | LEU/HEU Storage | X-345 | Storage<br>Ship/Receive<br>*See Note 1* | III |
| 14 | Oxide Conversion | X-705 "E" Area | Storage<br>*See Note 2* | IV |
| 15 | X-326L Hazardous Waste Storage | X-326L | Storage | IV |
| 20 | DMSA-12 | X-326 DMSA-12 | Storage | III |
| 21 | DMSA-20 | X-344 DMSA | Storage | IV |

Note 1: Category III quantity refers to HEU holdup in the shutdown High Assay Sampling Area (HASA). Containerized materials are Category IV.

Note 2: The Oxide Conversion MBA contains only process holdup material in inactive equipment.

**APPENDIX E-1 - DOE MBA'S, ASSOCIATED FACILITIES, AND SNM CATEGORY QUANTITY DESIGNATIONS**

**MONTH OF FISCAL YEAR**

| MBA NO. | MBA TITLE | O | N | D | J | F | M | A | M | J | J | A | S |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 | Scrap Storage | | | | | | X | | | | | | X |
| | | | | | | | | | | | | | |
| 10 | LEU/HEU Storage | | | | | | X | | | | | | X |
| | | | | | | | | | | | | | |
| 14 | Oxide Conversion[1] | | | | | | | | | | | | X |
| | | | | | | | | | | | | | |
| 15 | X-326L Hazardous Waste Storage | | | | | | X | | | | | | X |
| | | | | | | | | | | | | | |
| 20 | DMSA-12 | | | | | | | | | | | | X |
| | | | | | | | | | | | | | |
| 21 | DMSA-20 | | | | | | | | | | | | X |

Note 1: The nuclear material inventory in the Oxide Conversion MBA consists only of process holdup material. The annual inventory for this MBA consists of verification that all installed process equipment containing this holdup inventory is intact and has not been altered.

**APPENDIX E-2 - MBA INVENTORY SCHEDULE BY MONTH**

| Symbol | Bldg. | MBA No. | Description |
|---|---|---|---|
| 744G | X-744G | 7 | Non-$UF_6$ Low Assay Storage |
| 744S | X-744G | 7 | Non-$UF_6$ Low Assay Storage |
| 744U | X-744G | 7 | DOE Waste Management Area |
| 747G | X-747G | 7 | Contaminated Scrap Storage |
| 345C | X-345 | 10 | Center Work Area |
| 345H | X-345 | 10 | HASA (High Assay Sampling Area) |
| 345L | X-345 | 10 | Standards Laboratory |
| 345N | X-345 | 10 | North Storage |
| 345R | X-345 | 10 | North Storage Racks |
| 345S | X-345 | 10 | South Storage |
| 345W | X-345 | 10 | South Storage Sample Cabinets |
| 705E | X-705 | 14 | Oxide Conversion |
| 326L | X-326 | 15 | Non-$UF_6$ Storage |
| 326D | X-326 | 20 | DMSA-12 |
| 344D | X-344 | 21 | DMSA-20 |
| 7725W | X-7725 | N/A | DOE Waste Storage Area |
| 330D | X-330 | N/A | X-330 DMSA |
| 333D | X-333 | N/A | X-333 DMSA |

**APPENDIX F-1 - DYMCAS LOCATION SYMBOLS ORGANIZED BY MATERIAL BALANCE AREA**

| Account Number | Account Title |
|---|---|
| 800 Series of Accounts - RIS: GBA | |
| 810* | Oxide Conversion (Inactive) |
| 811 | Waste Storage |
| 816 | Uranium Management Center Non-$UF_6$ (DOE approval required) |
| 820 | Receipts/Shipments /Storage (Miscellaneous) |
| 826 | Measurement Standards |
| 830* | DMSA-12 Inventory |
| 840 | X-345 High Assay Sampling |
| 842 | Non-$UF_6$ Material for Conversion |
| 847 | Non-$UF_6$ Batching/Sampling and NDA Measurement |
| 850* | X-326 Cascade Holdup |
| 855 | Cylinder Field Maintenance |
| 859 | Scrap Cylinders and Containers |
| 870 | USEC Clean Empty Cylinders |
| 890 | New and Cleaned Cylinders and Containers |
| 893 | Cylinders Out-of-Service |

* NMC&A Use Only

**APPENDIX F-2 - NUCLEAR MATERIALS ACCOUNTS**

Uranium-bearing scrap and waste materials may be discarded and written off the accountability book records following approved procedures if the uranium is below the limit stated below:

| Material Type | Attractiveness Level | Discard Limit |
|---|---|---|
| Organic Solutions | E | All |
| Organic Solutions | C or D | None(1) |
| Other Processible Liquids | E (<20%) | All |
| Other Processible Liquids | E (≥20%) | 1 g $^{235}$U/kg |
| Other Processible Liquids | C or D | None(1) |
| Non-Processible Liquids | E | All |
| Non-Processible Liquids | C or D | None |
| Chemical Trap Material | E | All |
| Chemical Trap Material | C or D | None(1) |
| Other Processible Solids | E (<20%) | All |
| Other Processible Solids | E (≥20%) | 1 g $^{235}$U/kg |
| Other Processible Solids | C or D | None(1) |
| Non-Processible Solids (Excluding "Gunk") | E | All |
| Non-Processible Solids (Excluding "Gunk") | C or D | None(1) |
| "Gunk" | E | All |
| "Gunk" | C or D | None |

(1)- Attractiveness Level "C" or "D" materials may not be written off the accountability records and transferred to Waste Management unless a vulnerability assessment is performed and prior DOE approval is obtained.

**APPENDIX G - MATERIAL DISCARD LIMITS**

| Incident | Category |
|---|---|
| Inventory differences exceeding alarm limits in Category I/II/III SNM material balance areas where there is no indication or reason to believe the difference is created by loss, theft, or diversion. | IMI-3 |
| Identified SNM inventory differences beyond alarm limits in Category IV SNM material balance area. | IMI-4 |
| Significant shipper/receiver differences that exceed 200 grams fissile material and the combined limit of error for the shipment. | IMI-4 |
| Alarms or other loss detection indicators, excluding inventory differences and shipper/ receiver differences, that involve a Category III or IV quantity of nuclear material. | IMI-4 |

IMI-3 incidents are reportable to DOE-HQ within 8 hours following categorization.

## APPENDIX H - REPORTABLE CATEGORIES OF SECURITY INCIDENTS